

American Outdoor School
Wilderness First Aid
Course Book

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Introduction

Welcome to Wilderness First Aid, and welcome to the first step towards becoming a wilderness medical provider.

Here are the top three answers people come up with when asked about what makes wilderness first aid:

- Wilderness First Aid is about improvising equipment because equipment available in a wilderness setting (backcountry) differs from an urban environment (aka the front country).
- Wilderness First Aid deals with the lack of communication with the outside world because our phones will not work in the backcountry.
- Wilderness First Aid is about environmental factors like temperature, access, and weather conditions that make treatment more difficult.

While all those things are true, they do not get to the essence of wilderness first aid. Wilderness First Aid is about time. The difference between urban medicine and wilderness medicine is the time we have with our patients until we can get them definitive care. Definitive care is the end treatment that a patient needs.

Example 1: Imagine the patient has a massive burn. Most of us would take them to emergency care or a local hospital when what they need is to get to a burn center.

Example 2: Imagine the patient has two fractured femur. Most of us would take them to a local hospital or urgent care when they need to get to a level one trauma center with an orthopedic surgeon.

In the front country, access to definitive care is relatively quick, and in the backcountry, access to most forms of definitive care is slow. That means we have to be able to provide care for that patient until we can get them definitive care.

It does not always mean that every injury in the backcountry needs evacuation to a specialized hospital. For instance, if a patient gets a blister and is out on a hike, most of us can provide definitive care. However, three days out on a hike, a broken bone may take three days to get to a definitive care location.

Therefore, wilderness medicine has two distinct phases: emergent and management.

- 1) The emergent phase is where we take steps to ensure patients will not die in the next 10 minutes.
- 2) The management phase is managing patients over time until we get them out.

By the end of this class, we will learn to evaluate patients, decide what kind of care they need, and manage them until they can get definitive care.

Assessment

Introduction - Patient Assessment

Anyone can build a splint, and anyone can apply a bandaid. Patient assessment is the skill to realize when and why to build that splint, put on a bandaid, or seek further help. Patient assessment is an essential component of becoming a wilderness medical provider. Without a patient assessment, providing the proper care can not happen.

We will cover the following assessments in this section:

1. Primary: Addressing whether a patient will die in the next three minutes.
2. Secondary: Seeking to understand what is going on with the patient.
3. Orthopedic: Uncovering injuries, including sprains, strains, fractures, and dislocations.
4. Spinal: Identifying spinal injuries and managing the spine as a problem.
5. OPQRST and SAMPLE History: Method to effectively uncover sample histories and question patients.
6. Vital Signs: Learning what they mean and how to get them
7. Mental Status: Assessing how the patient is doing.

Patient assessment is the most critical component of becoming a wilderness medical provider. Enjoy learning about it as much as we enjoy teaching it.

Primary Assessment

The primary patient assessment identifies whether a patient needs emergent care, whether a patient will die in the next ten minutes, and if anything needs immediate attention. This critical step ensures we have the best outcome for our patients. Primary assessments start with looking at the scene and end with immediate actions prior to the secondary assessment.

The Scene

The first thing to do is look at the scene. Many components come into play when we are talking about the scene, and this part will look at scene safety, clues, and the number of patients.

Scene Safety

First, we must determine if the scene is safe for multiple people using three steps.

Step 1: Is the scene safe for the rescuer? If it is not, do not go in. By going into a dangerous scene, all that has happened is we have put ourselves in a position where we can become a patient. Not only do we potentially have two patients, but we potentially could lose our only rescuer. Ensure that the scene is safe. If the scene is not safe, do not go in.

Step 2: Is the scene safe for the rest of the group and any bystanders? It is vital to make sure that nobody else gets injured.

Step 3: Is the scene safe for the patient? Ensure that they are not in a dangerous situation, that they are not in immediate danger of getting hit by a rockfall, getting fallen on by a tree, or in a situation where the scene could become unsafe.

We follow these three simple steps to ensure that everything and everybody stays safe.

Clues

The second thing to do is look for clues. Clues lead to ideas about what might have gone wrong and what happened to this patient. We can get clues from bystanders, the patient themselves, or the scene or the situation itself.

However, do not mistake clues to mean we have identified the problem or injury.

Imagine a person who jumped off the roof of a building and landed on their head on the pavement. The only known fact is that the patient jumped off the roof and landed on their head. They may be injured, and they may have a problem. However, we do not know what that injury or problem may be. Do not make assumptions. We have not assessed the patient yet.

In the above example, a reasonable assumption may be that they have a head injury because they landed on their head after jumping off the roof. Therefore, we go into this situation expecting a head injury, and this kind of tunnel vision causes us to exclude everything else we might find. If we do not find a head injury, we will be baffled and may perform the rest of the assessment poorly.

Clues are indications or information from bystanders, the patient themselves, or the scene or the situation that might help advance what the problem is and how to manage it. We use that information as we go through the rest of our assessments.

Number of Patients

Finally, when examining the scene, we must thoroughly identify the number of patients at the scene. It may seem obvious, and it may seem that there is only one patient but confirm. Ensure that there is only one patient and not someone else who fell off-trail into the bushes. Perhaps one patient made it out of the tent, and another passed out inside. Confirm there is only one and not two or three, or four.

Patient responsiveness and immediate actions

After evaluating the scene safety, identifying clues, and checking the number of patients, we will approach our patients to see if they are responsive.

What is a responsive patient?

Responsive means the patient can interact. There will be a wide range of interactions like talking, screaming, moaning, or other incomprehensible sounds, which represent responsive patients. While they may present different problems or degrees of difficulty that we will have to manage, they all mean they are responsive.

The first step is to look and listen to whether the patient is responsive, like answering verbal cues. We want a responsive patient because it means all of this patient's vitals are functioning. We will have to check vital functions with an unresponsive patient to ensure the patient is alive.

Circulation, Airway, and Breathing (CAB)

Circulation

We want to know whether this person's heart is beating. We check whether this person has a pulse, and we find this out by checking for a pulse at the carotid artery.

We find the carotid artery on either side of the neck. In the center of the front of the neck is the trachea. Down the side of the neck is the sternocleidomastoid muscle. Right in between the trachea and the sternocleidomastoid muscle is a little valley. This valley is where the carotid artery runs.

Here is a trick to practice. Take an open hand, put the thumb on the chin and turn the hand toward the palm. The fingers will land just about on the carotid artery. Check for a pulse.

We check the carotid artery on an unresponsive patient rather than the wrist because this is the last pulse to disappear in a patient. This pulse will be there to the end, and if this one is not there, we know nothing is there.

Finally, if the patient has a pulse, keep moving to the airway. If the patient does not have a pulse, stop everything and move right into CPR.

NOTE: Consider taking a CPR (Cardiopulmonary resuscitation) class. It is an essential skill to learn.

Airway

If we have taken the above steps and the patient has a confirmed pulse, move forward to the airway. Again, if the patient does not have a pulse, we stop and proceed to CPR.

When it comes to the airway, we must consider what constitutes an airway problem. We are worried about a blockage of the airway or airway obstruction. Airway obstructions are anything that causes patients not to be able to move air in and out of their lungs.

Many of us will automatically assume choking. Do not. While choking can be considered an airway problem, in an unresponsive patient, it is not relevant.

In an unresponsive patient, we are most worried about their tongue. If a patient's airway is blocked or obstructed, it will be because their tongue has fallen back into the airway. When a person passes out and becomes unresponsive, all of their muscles relax, and the tongue is a muscle. When a patient is lying on their back, gravity will cause that tongue muscle to fall back and obstruct the airway.

We need to get that tongue out of the airway; all we need to do is tilt the head. By tilting the patient's head backward, we have opened the airway by causing the tongue to pull out of the airway.

Now that the head is tilted back, someone or something will need to maintain the patient in this position. Something under their neck to hold their head will suffice.

Once their head is back, we know their airway is open. Again do not worry about choking. Their airway is blocked because of their tongue. Tilt their head back, and we have an open airway.

Breathing

Finally, we have to make sure that this patient is breathing.

There are many ways we can ensure that a patient is breathing. We may have heard things like looking for the chest to rise or watching the stomach expand in and out. While those are good, they are not indicators of whether someone is breathing normally, especially if they are wearing many clothes.

Simply put, it is tough to know whether someone is breathing normally. Therefore we use all the tools and techniques at our disposal.

Techniques to check for breathing

- Look for a chest rise by lowering our heads down to their chest level.
- Put a hand on their chest or their diaphragm to feel for movement.
- Feel for air movement out of their mouth with a hand or a cheek.
- Place an ear next to the mouth and listen for air moving.
- Use a mirror to see if the mirror starts fogging.

Any of those techniques will work. If we determine the patient is breathing, move on to secondary assessment. However, just like circulation, if this patient is not breathing, it means they are not moving air in and out, and we go right into CPR. CPR is a crucial skill to learn.

CAB Conclusion

We have learned that we must check vital systems using CAB - circulation, airway, and breathing - with an unresponsive patient. However, in a responsive patient, we can check vitals merely by asking questions.

For example, we walk up to a scene. After checking for safety, clues, and the number of patients, we enter the patient responsiveness stage and proceed to ask the patient what happened, what is wrong, or what is going on. The patient says, "it hurts, I fell, I am bleeding". If a patient says their arm hurts, we know they have a pulse. If a patient says they fell, we know their airways are open. If they say they are bleeding, we know they are breathing. We know all of this because they are interacting and responsive.

If they are responsive, we know they have a pulse, an unobstructed airway, and breathing. Just because the patient is responsive does not necessarily mean the patient is OK. We will cover what to do next in the secondary assessment. For now, we know they are alive, which is the primary assessment's purpose.

In conclusion, problems with CAB are an immediate life threat, and assessing CAB is vital in addressing what will kill someone in the near term.

Rapid Trauma Scan

A rapid trauma scan finds existing life threats to the patient not identified with CAB. Specifically, we are looking for major or life-threatening bleeding—this type of bleeding will be prominent and noticeable when found.

It will be more evident in the middle of summer because the patient is likely wearing shorts and a t-shirt, and it may be hidden from plain sight in winter under layers of clothes. Either way, we are going to have to evaluate that patient.

The rapid trauma scan uses our hands to assess the whole patient and identify life-threatening bleeding. We may come across other injuries like a broken arm or leg,

pain in the chest, or bruising on the abdomen. However, those are secondary injuries and not immediately life-threatening injuries. We are looking for primary injuries that will immediately kill a patient. If we find life-threatening bleeding in a rapid trauma scan, stop and deal with it immediately, just as we did in our CAB assessment. How to manage life-threatening bleeding will be covered in another section.

Environment

The last step in a primary assessment is managing the environment for the patient and ourselves. At this point, we should have already determined if the patient is in a safe place. Additionally, we want to determine if the patient is comfortable and whether we can effectively treat them where they landed. We may consider temperature and conditions outside, the patient's general comfort, or whether the location is dry.

Making a patient comfortable is not just a nicety. Placing a mat under the patient, a hat on their head, a coat on their back, or a sleeping bag over their body can cause physiologic changes. It slows their heart rate down, brings their blood pressure down, brings their breathing down, and effectively tamps down their adrenaline response. These physiologic changes allow us to better assess what is going on with the patient.

Primary Assessment Conclusion

In summary, the goal of a primary assessment is to ensure the patient will not die in the next five minutes. Think of primary assessment as an emergency room. The job of an emergency room is to quickly assess incoming patients and ensure they will not die in the next five minutes.

Anecdotally, many of us have had that hurry-up-and-wait emergency room experience. Where we arrive expecting to be handled immediately for our broken arm and instead wait for two to three hours. It is not because they are not taking care of us but because we are not at risk of dying. Their primary focus is to take care of the dying people, which is the point of our primary assessment.

In the primary assessment, we take care of the problems that could kill the patient at any second. If we determine that the patient will not die, we take a deep breath. After our deep breaths, we make sure our patients and ourselves are comfortable and move on to secondary assessment.

Primary Assessment Worksheet

Secondary Assessment

Our primary assessment ensured that our patient would not die in the next five to 10 minutes. The next step in patient assessment is finding out what is going on with the patient through our secondary assessment. In this step, we want to determine what is wrong with the patient and the appropriate treatment.

Doing an excellent secondary assessment is the difference between a successful trip - i.e., the trip continuing or the patient being evacuated - or having a terrible outcome.

We need to uncover everything wrong with our patients in a secondary assessment. We can quickly get a patient to a hospital in a front-country setting. If we miss something before arriving at the hospital, the more trained medical staff can perform a further evaluation.

In the backcountry, all we have are our senses and the ability to interpret signs and symptoms. We must be thorough, and it is on us to perform a quality assessment.

Trauma Patient VS. Medical Patient

The first thing we have to do when we get to a secondary assessment is to decide what type of patient we have. We must determine whether it is a trauma or a medical patient.

It might seem weird to break people into these categories because, technically, every patient is a medical patient. In medicine, however, a trauma patient is someone who

suffers an injury. An injury is something that has occurred to them from the outside. A medical patient is suffering an illness, something that has occurred to them internally.

If we were to walk into an emergency room, there would be general emergency room beds and specialized bays; one is called a trauma bay, and one is called a medical bay. They are there because a trauma bay is set up very differently from a medical bay.

When we think of trauma patients, we think of broken bones, bruises, cuts, scrapes, bleeding, and wounds. When we think of a medical patient, we think of heart attacks, anaphylaxis, seizures, asthma, and strokes.

We must put our patients into one of those two categories to assess them correctly. While the overall assessment is the same, the order of assessments performed will change.

While a patient can have both an injury (trauma) and an illness (medical), we need to triage. We need to say which one of their problems is the most critical. For example, if a patient has a broken leg and is also complaining of an upset stomach, that patient will be a trauma patient. Conversely, if a patient has a seizure and sprained ankle, that patient will be a medical patient. Choosing the category is the highest priority for the patient. As previously mentioned, the assessments are similar but rearranged.

Trauma Patient Assessment

Step 1: Physical Exam

Physical exams are the best way to get information about a trauma patient's problems. Remember, traumas are injuries. Something has happened to this patient. We would use x-rays, cat scans, or MRIs in a hospital setting. In a back-country setting, we use our hands and our eyes. Therefore, the first step is to put our hands on the patient and do a physical exam.

Full Body Exam vs. Detailed Exam

We can perform two types of physical exams: a full-body exam and a detailed exam. A full-body exam is a head-to-toe inspection of our patient's body for injuries, and a detailed exam looks at a specific area where an injury occurred.

A full-body exam will be employed when the patient cannot give us enough information about the incident. We would do this when the patient is foggy about what happened with vague symptoms. We would do this when the patient is unresponsive. We would do this when the patient has experienced a traumatic event, and we do not have enough information to decide yet.

A detailed exam happens when we have a reliable patient to provide information about what hurts and point us to specific body parts.

Step 2: SAMPLE history

Once we have performed our initial exam and understand what is going on with the patient, the second step is to build our awareness about the patient. This awareness happens by collecting information about the patient using a SAMPLE history. Think about a SAMPLE history like the questionnaires a receptionist hands us at a doctor's office. The purpose is to get a general picture of the patient, their health, and any complications that may interfere with what we find in the trauma assessment. We call it a SAMPLE history because each letter represents an assessment we will perform.

In the subsequent sections, we will explain the different components of a sample history. However, we need to understand at this stage that a sample history is a general picture of a patient, medically speaking.

Step 3: Vital Signs

The third step is the vital signs. Most of us have probably heard the term “vital sign.” However, vital signs will likely be different from what many think they mean. We will go over vital signs and how to get them in subsequent parts of this course.

Those are the three steps in a trauma assessment. In summary, the patient had a traumatic event, so we determined they were a trauma patient. We performed a head-to-toe or a detailed exam on the patient. We collected the patient's history through our SAMPLE method and obtained vital signs. These three steps will uncover a story about an incident that impacted our patient from the outside.

Medical Patient Assessment

We approach a medical assessment differently than a trauma assessment. Remember, a medical patient has an illness. Often these patients will complain about feeling bad, a stomach ache, fatigue, weakness, dizziness, and nausea. All of those things indicate a medical condition.

In terms of the assessment, squeezing their head will not reveal anything for someone with a headache. Touching and feeling them through a physical exam is not the best way to assess this patient.

What we need to do is ask many questions. Therefore, medicinal patients can be more challenging to assess.

Medical patients are a detective story because it all comes down to asking questions and listening to the answers. We will start with a preset series of questions for a medical assessment, and these questions are represented in the acronym OPQRST.

Step 1: OPQRST with Vitals

OPQRST. Each one of those letters stands for a question that we can ask. These are not all the questions we can ask, and we do not always have to ask all of these questions. Nevertheless, it is a way to get us started. It is a way to get us engaged with the patient and begin understanding their medical condition.

We will include vital signs in step one of the medical patient assessment. As we mentioned in the trauma patient assessment, most of us have probably heard the term “vital sign.” However, vital signs will likely be different from what many think. We will go over vital signs and how to get them in subsequent parts of this course.

Step 2: SAMPLE History

Once we have performed our OPQRST and vitals, the second step is to build our awareness of the patient's medical history. We do this with the SAMPLE history method, just like a trauma patient assessment. The subsequent sections will explain the different components of a SAMPLE history.

Step 3: Physical Exam

Step three may seem out of place, given that we said in step one that a physical exam was useless for dealing with headache complaints. Nevertheless, it can be essential, and it is something that we will likely do, no matter the patient type. Sometimes a patient suffering a medical condition can have a traumatic injury masked by that medical condition. It is also advisable to perform a physical exam if the patient's symptoms are vague and not pointing anywhere.

When it comes to being thorough, it is always better to do more assessments than less. Do not make assumptions at the start because assumptions can lead to biased assessments. Instead, come to the patient with curiosity, an investigative mindset, and a desire to figure out how best we can help the patient.

Upon completing a secondary assessment, we should have a good idea of what is going on for the patient. We may not have a diagnosis, and that is okay. Keep in mind that thousands of medical conditions and traumatic problems can occur. We will not be able to learn all of them in this wilderness first aid class. We will, however, learn the most common ones and, more importantly, how to perform a patient assessment. From that, we will get an idea of what is going on with the patient, and the body systems involved, which leads us to the steps we need to take.

List of Problems

By the time we finish an assessment, we should be able to put together a list of problems found. It may be complaints of stomach pain, and we might not be able to get any further than that. Yet, it might be a bone protruding from the left forearm, pain over the left inside of the knee, or a right ankle deformity. All those are examples of problems that will make it onto our problem list. It is essential to be thorough about a problem list because, without a problem list, we will not be able to put together a treatment plan.

Treatment comes much later. We will learn how to treat all these problems in this course, but if we go back to that example of the broken arm in the emergency room, we have time to apply the treatment. Just like in the emergency room, once we recognize the patient will not die immediately without intervention, we can take a big deep breath, do good assessments, come up with a thorough problem list, and build a treatment plan for each of those problems.

Orthopedic Injury Assessment

Once we have a handle on general patient assessment, we can dive into specific problems we will find in the backcountry and how to assess and manage them.

We will start with orthopedic injuries, which include sprains, strains, fractures, and dislocations. There are many ways to assess these injuries, and we will lay out, in an orderly pattern, methods to decide whether we are dealing with sprains, strains, fractures, or dislocations.

We differentiate between sprains, strains, fractures, and dislocation because, while treatment is relatively the same, it may determine whether we can continue the trip as planned or if we need to get the patient out of the woods as soon as possible. More specifically, if the patient has a fracture or a dislocation, we are most likely getting this patient out of the woods. Whether rapidly or over a couple of days.

For a sprain or a strain, we may be able to treat them in the woods and continue the trip based on the extent of that injury. If we can not differentiate, we need to treat any problem as if it were a worst-case scenario.

Sprains

Sprains happen to ligaments. Ligaments hold bone to bone, and they connect two bones. That means we will find ligaments in the joint space that will span a joint, connecting those bones. Most of us are familiar with the ligaments in the knee, like an ACL, MCL, PCL, or LCL.

Try feeling around the knee now and notice that these ligaments surround the joint. That means they provide stability to the joint area, which will be important when we manage this problem. Remember, they provide stability to the joint.

We use two descriptors to identify the pain we encounter with orthopedic injuries. The first is pinpoint pain. Pinpoint pain means the pain is in one area the patient can identify. It might hurt around that area, but if we asked the patient where it hurts the most, they would point to one spot. The second is generalized or global pain, where the pain is over a whole surface area. In this case, the pain is not just in one spot but broadly in an area.

The pain that's associated typically with sprains is generalized or global. It does not mean that it will not hurt in a specific spot, though that spot will be bigger than in the case of a pinpoint pain.

Strains

Strains happen to tendons and muscles.

Muscles provide mobility allowing us to move our bones back and forth, and we find them between the joint spaces. Think about joints as a base camp from which we can map out all of our orthopedic injuries.

Tendons are the ends of our muscles, and tendons grab onto muscles and attach them to the bone to move that bone. When we think about tendons, most people think about the Achilles tendon.

Feel for the Achilles tendon by feeling down to the bottom of the calf. Notice it is sinewy and can be plucked almost like a guitar string. We can find these in our elbows, wrists, and multiple parts of our bodies. They are all over and most likely tendons if they feel like a guitar string. Again, tendons attach muscle to the bone, allowing the bone to move.

So, where ligaments provide stability of a joint, tendons and muscles provide the ability to move around. An injury to a tendon or muscle will cause a lack of mobility. In contrast, an injury to a ligament will cause instability in the joint.

As mentioned, we find tendons and muscles between joints. To find a tendon, we need to progress down the muscle. When inspecting a strain and looking for a tendon, start on the muscle, follow the muscle down, and we will find that tendon.

In terms of the pain to expect, based on the two types of pain to look for in an orthopedic injury, pinpoint or generalized, strains tend to be generalized pain.

For example, let us say someone goes for a run. The person gets back from their run and their legs. Rarely will they say their leg hurts in a specific spot. Usually, they will say their muscles are sore or their legs hurt. That is the way to think about generalized pain. While it may be excruciating pain, strains tend to be generalized pain.

Fractures

We fracture a bone. There are many bones in our body, and they all have names. It can be fun to learn all the names of the bones in the body, but we will not do that because we do not need to know them in this course. Nevertheless, we need to understand that we fracture bones in contrast to dislocations which is an injury to a joint.

Bones provide stability and structure for our bodies. Understand that if we have a fracture, there is potential for losing the structure and stability bones provide. Once we understand this, we can use it as one of our diagnostic tools. In other words, if we lack structure, perhaps we have a fracture.

For example, if we believe we might have a fractured bone, we can use joints as our base camp. Knowing we find bones between joints, we can use the location of the injury to help us decide if we have a possible fracture.

Fractures tend to have pinpoint pain, with patients saying it hurts in a specific location. There may be pain around the area, but they tend to have pain in one specific spot that is the worst. This type of pain can help us diagnose it as a fracture.

Dislocations

Dislocations are the easiest of orthopedic injuries to diagnose.

Often people will say they fractured their ankle, wrist, or elbow, which is scientifically incorrect because the ankle, the elbow, and the wrist, are all names for joints. A doctor may say the ankle is fractured, which can be easier than telling someone they fractured the distal end of the epicondyle plate of the tibia. Some people would hear that and think they have cancer.

That said, we dislocate joints like the ankle, wrist, or elbow. When we dislocate joints, we diagnose them by looking at them. The nice thing about the human body is that it is symmetrical. We can compare one side of the body to the other. If someone complains of shoulder pain on the left, we can look at the left and the right, and they should look the same. If they do not, it is probably a dislocation. A dislocation is going to look weird.

One complicating factor is that someone can fracture an arm causing it to be bent 90 degrees in the wrong direction. So telling the difference between a dislocation and a fracture can be difficult.

There are a few ways to differentiate between a weird-looking fracture and a weird-looking dislocation. First, examine the location of the injury. A dislocation will be at the joint, and a fracture will be between the joints. Second, a dislocation will look weird and rigid with the dislocation held firmly in place because the muscles around it are spasming down. In this case, the muscles try to lock that dislocation in because they do not like where it is. In contrast, a fracture will look weird and floppy because we have lost the structure.

Orthopedic Injury Assessment Conclusion

Once done with the assessment and the patient displays an orthopedic injury, we will perform a detailed exam on the injury. We will hone in on the body part and start squeezing and applying pressure at the location of the injury.

People who get into medicine for the first time have difficulty squeezing on injuries because many of us fear causing pain or making it worse. Squeezing will not make it worse. It may hurt the patient, but this is necessary because we do not have an x-ray or other imaging machines in the backcountry. Our hands are the only machine we have. If we do not get our hands on the injury, we may not be able to find the injury; it is on us to perform a detailed examination.

The following is a good order of operations for assessing orthopedic injuries.

First, assess the type of pain, generalized or pinpoint. Second, identify the location or body part involved, joint, muscle, tendon, ligament, or bone.

Sample Orthopedic Injury Assessments:

Example 1: We have generalized pain, at the joint, with good mobility in that joint, with some possible laxity of the joint; probably a ligament issue and most likely a sprain.

Example 2: We have generalized pain between the joints and some mobility problems; probably a tendon or muscle issue, and most likely a strain.

Example 3: We have pinpoint pain between the joints with possible loss of structural integrity; probably a bone issue, and most likely a fracture.

Example 4: We have a weird-looking body part at a rigid joint; most likely a dislocation. (Note that a floppy, weird-looking body part is most likely a fracture.)

Spinal Consideration

Spinal Injury Myths

One topic that tends to dominate everybody's thinking when it comes to medicine is the spine. This section is about learning to assess the spine and what it means to take spinal precautions. We will learn what we have to worry about when dealing with the spine, how spine injuries occur, and how they affect us as medical providers.

When unfamiliar with emergency medical care, fears of a spinal injury tend to paralyze people into inaction. One of the most common things we hear when someone falls off their mountain bike, takes a nasty tumble, or skis headfirst into a tree is "do not move," "do not stand up," or "nobody touch them." Let us start with where and why we learned these maxims and why not moving someone is a common misconception.

The idea of not moving somebody stems from the standard first aid course designed for an urban population, where the consensus is to call 911 and have someone better trained show up and take care of the patient.

Additionally, when many of us think of spinal injuries, we think of the signs and symptoms of someone paralyzed who cannot move a limb and cannot feel something. A spine injury is an injury to the vertebrae and the bones in the back, not the central nervous system.

For example, if a patient has a broken forearm, no one would tell them not to move their arm because they might be paralyzed from the elbow down. It would be more common for somebody to say, "can you wiggle your fingers."

When it comes to the spine, it feels different because the spine encloses our central nervous system. It can be a disaster if something goes wrong with the spinal cord. Nevertheless, a spine injury is an injury to the vertebrae and the bones in the back, not

the central nervous system. We can treat it like any other broken bone, which we will discuss when we get to managing orthopedic injuries.

That said, we are always concerned when damage occurs to the spinal cord because a spinal cord injury can cause paralysis and other lifelong complications.

However, it is hard to cause damage to the spinal cord.

For example, take somebody injured and lying on the ground after falling over the handlebars on their mountain bike. As part of our primary assessment, we may want to move them to a safe place away from dangerous situations. Perhaps the patient wants to stand up or sit up, and understandably we might be nervous about them moving.

If an accident or an incident occurs and a patient incurs a spinal cord injury, they have a spinal cord injury—end of the story. That may sound simple, but that is what it is. The spinal cord injury will occur at the time of the incident, and they will have cord damage. If the accident or the injury occurs and they do not have spinal cord damage, then they do not have spinal cord damage.

Likely many of us have “what-if” scenarios swirling in our heads.

“What if the patient fractured vertebrae and shards of bone are sitting there pushing against the spinal cord, just waiting for us to move the patient the wrong way, thus severing the spinal cord?”

These fears are valid, but medical science says it does not happen or work like that. There are many physiologic reasons, but suffice it to say it does not happen. We either get spinal cord damage when the injury occurs or not.

Allowing someone to sit up or get in a position of comfort and to walk out, if possible, will not cause any more harm.

Let us go through a scenario. Suppose we walk upon a patient on a trail hike, and they had an incident with the potential for cord damage. Remember that the incident has to be enough to have caused potential cord damage. If someone is sitting on a rock, slips off the side, and lands on their butt, a foot down, that is not a spinal cord damage incident. Conversely, if someone tumbles down a trail into a tree head first, we now have a mechanism with the potential to cause a cord injury.

Assessing a Spinal Injury

We begin our primary assessment, asking them, "can you move your arms and fingers or legs and toes?" Or "do you have numbness or tingling in your arms and fingers or legs and toes?" If they can move these body parts and have no numbness or tingling, we have established that they do not have cord damage, and we now do not need to worry about a spinal cord problem.

On the other hand, if they can not move their legs and toes or arms and fingers, we have established the possibility of spinal cord damage.

At this point, we do not need to do anything special. We now know the patient will not be able to walk out, and we will need to start planning for a carry.

If we have to carry out a patient with spinal cord damage, we do not put them on backboards or immobilize them. If we get to or find a patient with suspected spinal cord damage, we move them to a stretcher as safely as possible into a comfortable position. Simple as that.

OPQRST and SAMPLE History

We have done the primary assessment and set up the secondary assessment. Now we need to discuss the acronyms OPQRST and SAMPLE.

If we are going to ask the patient questions, we need to ask them for a reason. The purpose of questioning the patient is not to fill time or because we are unsure what else to do. If we ask a question, listen to the answer. When they answer, try to figure out what it means. Use each answer to inform further questions. Hear what the patients are telling us. Otherwise, there is no point in asking those questions.

OPQRST

OPQRST is a way to ask questions about what might be going on medically with our patients. Not all of these questions will be relevant to every patient, and sometimes we must follow up with more questions. We may find that every question we ask leads to another, which is perfectly fine. Assessment is about getting to the bottom of the problem. Ask as many questions as needed until we figure out the answer or get as much information as possible.

O for Onset.

Onset has two components. The first is when the problem began. Whatever issue the patient is complaining about - headache, nausea, chest pain, difficulty breathing - we want to know when it started. We want to know whether it started twenty minutes ago, one hour ago, or one second ago. The second is what the patient was doing when the problem began. We want to know what they were doing, whether sitting, hiking, running, or biking. Finally, we need to put the two together.

For example, a patient is having chest pain. The patient says the chest pain began 20 minutes ago. When asked what they were doing when the chest pain started, they said they were trail running. Separately, another patient with chest pain that started 20

minutes ago says they were sitting and having lunch when it began. The same 20 minutes, but a very different activity, tells us something different about each patient.

Later we will get to what this information is telling us. At this stage, all we need to do is gather information about when and what the patient was doing when it started.

P for Palliate / Provoke

Palliate refers to anything that makes the patient better. Whatever the patient's complaint, we need to find out if there is anything they have done in the past that makes them feel better.

For example, if the patient complains of a headache, we need to find previous solutions to their headache. They may say that closing their eyes and blocking out the light makes their headache feel better.

Provoke, on the other hand, refers to anything that makes the symptoms worse. We want them to name anything that they have done or that we have done that makes it worse.

For instance, a patient says they have trouble breathing. We ask whether anything makes it worse, and they say it worsens when they lie down.

Again, if the patient has trouble breathing and says sitting up makes it better while lying down makes it worse, we now know sitting up palliates the symptoms, and lying down would provoke them.

Q for Quality

Quality means asking the patient to describe, using adjectives and in their own words, how the symptoms feel.

For instance, the patient says they have pain in the abdomen, and we ask them how that feels. We can point out a few descriptive words they can use because people do not always have the words to describe the pain they might be feeling. We can ask whether it is cramping or burning pain or stabbing or squeezing pain, and all of those terms mean different types of problems.

R for Radiate

Radiate refers to whether the problem goes beyond the initially identified problem zone.

For example, the patient complains of pain in the upper right quadrant of the abdomen. We follow up with a question about whether they are experiencing pain elsewhere. They say they also have some pain in the right shoulder. We ask whether they landed on or hit their shoulder, and they say no, and that would be radiating pain.

Radiating pain can also mean the pain started in one spot and moved to another. For instance, a patient may indicate pain in the lower right quadrant of their abdomen, and we ask whether it has always been there. They say the pain was in their stomach a couple of days ago. Therefore, the pain radiated, meaning the pain moved from one place to another.

S for Severe

This question directs us to the severity, or degree, of the pain the patient is experiencing.

We use a 1 out of 10 scale. Many of us have likely been asked to rate our pain on this scale at some point, and it is a handy scale when appropriately used.

There are a couple of things to understand about this scale. First, this is the patient's pain scale, not ours. It is not about what we think the pain should be; instead, it is about what the patient is experiencing.

For instance, if a patient has a hangnail and they tell us it is a 10 out of 10 pain for them, it is a 10 out of 10 pain. Alternatively, if someone is missing their left leg and says it is a 2 out of 10 pain for them, it is a 2 out of 10 pain. What is suitable about this pain scale for our purposes is how it changes over time. As time progresses with our patients, things will change, and change over time is the primary purpose of the pain scale.

Pay special attention to the concept of symptoms changing over time. Throughout this class, we will come back over and over again to how problems or symptoms change over time.

As an example, we come upon a patient, and at the right time in our assessment, we ask them how they would rate their pain on a scale of 1 out of 10. The patient says 7. 30 minutes later, after applying treatment and taking care of the patient, we ask about their pain level, and they say 4. By following the patient's severity of pain over time, we can determine whether the patient is getting better, worse, or staying the same. Knowing this allows us to adjust treatments as medical providers.

T for Time

As we know, changes over time are helpful for us as medical providers. Here we care about changes in the problem from the onset before our arrival. Whether it started 20 minutes ago, one day ago, or three days ago, we need to find out if there is anything different from the first time the signs and symptoms occurred compared to what the signs and symptoms look like now.

One of the things that we ask patients in an urban environment is what makes them seek help. If something began two days ago, what changed to make them seek help now?

OPQRST questions act as a guide to get more information from the patient, especially when the issues are internal. Since we can not see internally with the patient, we use questions to gather the information.

SAMPLE History

SAMPLE History is a guide for asking questions about a patient's general medical history.

S for signs and symptoms.

Signs and symptoms are two different things. Signs are the objective facts that we can see. For example, the patient is sweaty and pale and has vomited. Therefore, signs can be physically measured and objectively identified.

On the other hand, symptoms are issues the patient is experiencing that we can not objectively measure or identify. For example, symptoms are if the patient feels dizzy, weak, or nauseous.

We must figure out the patient's collection of signs and symptoms. For instance, we may run into a patient saying there is a problem but does not have any related symptoms. Before moving forward on this assessment, we want to ensure they have signs and symptoms.

A for Allergies

Knowing patient allergies is essential.

We start by asking whether they have any allergies. If a patient replies with no, ask again to confirm their answer. Prompt them by asking if they have any allergies to foods or medications. If not, we can move forward.

If a patient has an allergy, first identify the cause or source of the allergy and, second, the severity of the allergy. The source or cause of an allergic reaction can be aspirin,

bees, pollen, shellfish, or anything. The severity of the allergy allows us to differentiate between an allergy that could kill them and an allergy that's uncomfortable for them. The severity of the allergy is the most crucial question here. An uncomfortable allergy is not of concern at this stage, whereas an allergy that could kill them is essential to know.

We will cover anaphylaxis later in this course. However, it is essential to know if a patient's allergy to aspirin causes swelling to the point where they can no longer breathe and need hospitalization.

M is for Medications.

We have to find out what medications the patient currently takes.

Just like with allergies, we will ask whether they take any medications. If they say no, confirm and move on by saying, "no medications, nothing prescription, nothing over the counter, and no herbal supplements, correct?"

If the patient says yes, find out the medication. There are thousands of medications, and we will never know all of them. So always ask why they are taking the medication. They may say it is for a heart problem, blood pressure, or an infectious disease. Whatever they say, we want to get as much information as possible about that medication, including dosage, the last time they took it, and any recent changes to the medication.

Their answers may not get us to a point where we can diagnose the medical problem, but the information can be crucial for anyone down the line to help care for this patient.

P for Past Pertinent History

Past Pertinent History refers to anything in the patient's medical history related to the problem they are complaining of now.

Patients have lots of medical history, but we want to know if there is anything in their medical history that we should be aware of as it relates to the problem.

For instance, the patient complains of chest pain. We want to know if they have heart disease, have had a heart attack in the past, or have a family history of heart disease.

Maybe the patient is having breathing problems. We need to know if they have asthma, have suffered from COPD, or have had any other breathing issues in the past.

Maybe the patient has a possible broken bone. We can use previous similar injuries as points of comparison for the patient. We can ask them to compare the pain and whether it feels worse or similar to their previous experience. If it feels similar, that goes a long way to help us assess the problem. If they say it feels completely different, that also helps us diagnose.

L for Last in, Last out.

In many ways, last-in and last-out is an overvalued topic, especially in the outdoor world. Last-in refers to when, what, and how much the last time the patient ate and drank, and last-out refers to the last time the patient urinated or defecated.

Hydration and urine output are important subjects and will be discussed further in the section about hydration.

Regarding defecation, unless there is a specific reason to ask this question, like a patient complaining of abdominal pain, constipation, diarrhea, or upset stomach, we do not need to know the last time they had a bowel movement. If the patient has a possible broken arm, the last time they went to the bathroom has no relevance. However, we want to know when the problems are diarrhea, constipation, an upset stomach, nausea, or vomiting.

A typical situation for last-in is a group of friends on a hike, and one of them suddenly sits down and says they do not feel well. The first question many will ask is when was the last time they ate. Maybe it is 2 PM, and the patient says they last ate at 8 AM. Many people would immediately run and grab a granola bar saying they probably have low blood sugar. Unless the patient has diabetes, food is not their medical problem. This way of thinking can cause tunnel vision. Sure, giving them some food may alleviate the problem somewhat, but thinking food is the solution is incorrect.

At this point, the appropriate way to treat last in and last out is to gather the information and use it in conjunction with the rest of the questions we have asked up this stage to construct a complete picture of our patient.

E for Events

E for events is a recap of the entire story of what we found out so far. We review our notes with our patients from beginning to end, and it acts as a review from as recent as ten minutes ago to as far back as three days ago if it is relevant. We want to ensure we have it right so far and say it all back to them to ensure we have all the correct information.

Events are our chance to put everything together and are the end of the second step in both our trauma and medical patient assessments. Our next step in assessing a trauma patient is to obtain their vitals and for medical patients to consider doing a physical exam.

In review, OPQRST questions are medical questions designed to help us understand what is happening with our patients right now. SAMPLE history is our way to get a helpful patient history.

Vitals

This section will examine why vital signs are essential, how we get them, interpret them, and use them.

Vital signs appear in both the trauma assessment and the medical assessment. Notice that there is minimal discussion about vital signs on the trauma assessment, whereas they appeared first on the medical assessment. Keep that in mind as we move forward.

Heart Rate

The first vital sign to obtain is heart rate (HR). We gather a heart rate by getting a patient's pulse. There are many pulse points in our body; we will discuss a few of them.

The first one is our radial pulse. We find the radial pulse on either wrist. Using the tip of the index and third fingers of the other hand, feel the pulse in the radial artery between the wrist bone and the tendon on the thumb side of the wrist. Apply just enough pressure to feel each beat. Some people have to push harder than others; some have to push lighter. Be sure to practice.

Once identified, count the number of beats for 15 seconds. Take the number of beats and multiply by four, giving us our beats per minute or our pulse rate.

We can obtain that number with our radial or carotid pulse, which we have already discussed how to find, but we generally only use a carotid pulse in unresponsive patients. We will discuss other pulse points further in the blood pressure section.

The number of beats per minute is valuable but not the whole story. A patient's pulse rate is only a number in time. So as we are getting the rate, we also want to identify two other things: Rhythm and Quality.

Rate is the number we have already obtained; beats per minute.

Rhythm is whether the heart rate is regular or irregular. We want to identify whether the beat is steady or if the intervals between beats are changing.

Quality asks us to describe the beat. Try to notice whether it is a strong pulse or a weak pulse. Note whether it was tough to find the beat.

Rhythm and quality are more important than the actual number.

The average beats per minute are between 60 and 100. However, some people are well below 60, and others are well above 100.

The rate also depends on what they did before we got the rate. If the patient was sitting on a sunny rock on the side of the trail, they might have a low pulse rate. If the patient was just trail running, they might have a very high pulse rate. Neither of them is in distress, so put the pulse into context. For instance, 80 regular and strong tells a very different story from 80 irregular and weak.

So when obtaining a pulse, count the beats in 15 seconds, multiply by four, but then pay attention to the regularity of the pulse and its quality.

Respiratory Rate or Breathing Rate

As previously mentioned, it can be hard to get a breathing rate on a person. Next time you are around a family member, try to count their respiratory rate during normal breathing. It is difficult because there are no telltale signs of normal breathing. Likely all we know is that because they are alive and in front of us, they are breathing normally. Getting a number for a respiratory rate is good but challenging.

The nice thing is that if someone is breathing hard or having difficulty breathing, it is easy to count the number because they are breathing either fast or slow. Just like in heart rate, what matters more is rhythm and quality.

One breath is in and out, and a resting individual's average breaths per minute are between 12 and 20. Some people's rates are below 12, and others are above 20, so context - whether they were running or napping - matters.

For instance, someone breathing 16 breaths per minute whose breaths are regular and not working hard to breathe is very different from breathing 16 breaths per minute, but they are irregular and shallow. Rhythm and quality are paying attention to their overall work of breathing.

How hard a patient has to work to breathe matters. If they have to work to move air in and out, they will use up a lot more energy, tire more quickly, and eventually, lose their ability to breathe in and out.

So get a rate, get the rhythm, pay attention to the quality and look at the work of breathing.

Skin Color, Temperature, and Moisture

We want to learn about the patient's skin color, temperature, and moisture. These three things may not seem like they go together, but in the medical world, they do.

We will start with what is normal and report any deviations from normal to use later when we learn about different conditions we may encounter.

Moisture

We start by touching the skin on the hands or the face. The typical person should feel dry and not parched or soaking wet at rest; if it is something different, we want to make a note.

Temperature

Again, the patient should feel warm by touching the skin on the hands or the face. The average skin temperature is about 90 degrees and should feel warm to the touch. If the patient is really hot or really cold, that tells us something, and we want to make a note.

Color

In a normal person, we are looking for the color pink. Healthy individuals moving oxygenated blood around their bodies should have pink skin. We find this by looking at the inside of the patient's gums or eyelids. These are their mucous membranes, and those on everybody around the world should appear pink.

Pink tells us that they are getting oxygenated blood all the way out to the last ends of the capillaries. We can look at a patient's skin color in lighter-skinned people, and in darker-skinned individuals, we look at the mucus membranes as mentioned.

Pupils

Checking for pupillary response is under the vital sign category but is only used in specific situations. By the time a patient's pupils have changed, it means something terrible is going on. Any changes to the pupils are a late sign and signal the end of being able to do anything for them.

PERRL

When assessing whether their pupils are normal, we use the acronym PERRL.

P - Pupils

When looking at the pupils, we look for what the average pupil should be doing.

E - Equal

A person's pupils should be equal or the same size.

R - Round

A person's pupils should be round to indicate no trauma to the pupil.

RL - Reactive to Light

A person's pupil should constrict or get smaller when we shine a light in one of their eyes and open up when we remove the light.

Blood pressure

Blood pressure will be our final vital sign. Blood pressure is a sign of our ability to get blood out to organs and keep our bodies perfused with oxygenated blood.

We will discuss how to use blood pressure to monitor a patient. That said, we can not get the patient's blood pressure without a blood pressure cuff. We may bring one on a much bigger expedition, but most trips will not. For that reason, this course does not cover how to use blood pressure cuffs.

While we have established that we can not get an actual number without a blood pressure cuff, we can estimate a patient's blood pressure utilizing other means. In a back-country setting, the estimation of blood pressure allows us to see if our patient still has good perfusion of their organs.

Blood pressure estimation uses pulse points. Every pulse point in our body requires a certain amount of pressure to receive enough blood to cause a pulse.

Average Blood Pressure

There are two components to blood pressure, the systolic and the diastolic. We do not need to worry about remembering these terms but understand that blood pressure by estimation can only collect the systolic or the top number. The average blood pressure is 120 systolic over 80 diastolic. The systolic number correlates to when the heart is pumping blood out to the body.

Radial Pulse

The first pulse point we use is the radial pulse. If it is nice and strong, the systolic pressure, or top number, is at least 90. It could be 150, but we know it is at least 90 because it takes that amount of pressure to get blood out to the radial artery.

Femoral Pulse

The second pulse we use is the femoral pulse. We will be unable to find it sitting down and need to be flat to find the femoral pulse. It sits between the hip bone and the top of the crotch, where there is a little valley. We press down with our hands pretty hard, and we should be able to feel the femoral pulse. If we do not find a radial pulse but a femoral one, we now know the blood pressure is between 80 and 90.

Carotid Pulse

The final pulse we use is the carotid pulse. If we do not find a radial pulse or a femoral one but find a carotid pulse, we now know the blood pressure is between 60 and 80. If we do not have a carotid pulse, this person is deceased, and we will start CPR.

Vital Signs Conclusion

That concludes our section on vital signs. As we have learned, vital signs do not tell us about the patient or the problems they might be encountering. Vital signs are best for recognizing trends in our patients over time and how they change. Therefore, the purpose of vital signs is to formulate a trend. Get a set of vitals immediately, another after 10 minutes, and multiple after over appropriate time intervals. Over hours or even days, we can look at that trend and assess the patient's ongoing condition.

Suppose the patient starts to deviate from our trends in either direction. Perhaps our treatment is not working and may need an adjustment, or we may need a faster evacuation. Conversely, we may conclude that our treatments are helping if the trends remain consistent. Vital signs, however, will never diagnose our patient and are meant to help trend our patient and guide treatment over time.

Mental Status

Mental status is the key to understanding our patients. Assessing and monitoring a patient's mental status is the best way to know if our patient is getting better or worse. Assessing mental status is our window into the body's functioning systems.

We could ignore all other vital signs and only look at mental status as an indicator of how patients are doing, and that would be fine. Of course, we do not do that as we assess everything collectively, but paying attention to a patient's mental status is the key to understanding how they are doing. The reason is that their mental status is an indication of brain function.

Our brain is so vital that it gets the first claim on everything, including oxygen, blood flow, and nutrients. It also reacts very quickly to minor changes in temperature, pH balance, and intracranial pressure. As a result, any minor changes in the body will manifest as mental status changes in one way or another, and mental status can change quickly.

One thing that happens when people get into medicine and start thinking about mental status changes is that they are looking for significant changes. They are looking for the patient who goes from talking normally to mumbling; or from mumbling to unresponsive.

While that can happen, if we are watching only for those dramatic changes, we will miss all the minor changes that will allow us to prevent the significant changes. When observing mental status, think about the person who says they are not feeling well, who goes from chatty and outgoing to quiet and grumbling.

Attention to mental status is the best way to monitor a patient and catch an underlying condition early.

Monitoring Mental Status

Like with vital signs, we can use letters, numbers, and scales to monitor mental status.

AVPU Scale

The first scale, the AVPU scale, is probably the most common one in prehospital-based medicine for assessing mental status.

U for Unresponsive

The patient does not respond to any stimuli. We can poke them, yell at them, and squeeze their fingertips without response. We would say the patient is U on the AVPU scale.

P for Pain or Painfully Responsive

This patient appears to be unresponsive. We can yell at them without response, but as soon as we apply a painful stimulus to this patient, we get some sort of response. If we remove the painful stimulus, they appear unresponsive again. A patient responding only to painful stimuli is a P on the AVPU scale.

V for Verbal

This patient appears to be unresponsive, but if we speak to them and give them a verbal stimulus, we get a response back. If we are not actively engaged in speaking to them, they appear unresponsive again. A patient responding only to verbal stimuli is a V on the AVPU scale.

A for Alert and Oriented

The alert patient appears to be there. We walk up, their eyes are open, and they appear alert. However, we want to know how alert our patient is. We want to know if they are alert but not all there, completely aware of everything happening, or something in between. We use three criteria to examine the patient's level of alertness by orienting them to person, place, and time. We refer to them as alert and oriented (A & O)

A person who knows who they are (person), where they are (place), and what time it is (time) would be A & O x 3.

A person who is alert and oriented and knows their name and where they are but cannot answer any questions as it relates to time - the actual time of day, the date, the month, or the year - would be A & O x 2.

A person who is alert and oriented and knows their name but is unclear as to where they are and cannot answer any questions related to time would be A & O x 1.

A person who is alert and oriented but does not know their name, where they are, or what time it is would be A & O x 0. They are alert but oriented to nothing.

Limitations of the AVPU Scale

While this scale seems pretty straightforward, let us look at some examples to understand the limitations of the AVPU scale.

Let us look at painfully responsive patients. We could have three examples of patients who respond to a painful stimulus. When a painful stimulus is applied, one patient moans, another patient says stop, and the last patient flexes or extends their limbs. All those patients would be a P on the AVPU scale, but they all represent very different patients, leading us to start qualifying each patient, thus adding additional complexity.

It is even more complex with verbally responsive patients. We could have four examples of patients who respond to a verbal stimulus. One patient mumbles, another patient groans, the third patient uses incomprehensible sounds, and the final patient speaks in complete sentences. All of them are V, but they are all very different patients.

If we add the alert and oriented scale, we could see how that could get even more complex. For example, what if we have one A & O x 2 who knows that it is Monday, another A & O x 2 who knows that it is one o'clock on Monday, and one A & O x 2 who

only knows it is 2022. These patients meet the criteria for an A & O x 2, but we could see how there would be a wide range of potential issues.

Glasgow Coma Scale (GCS)

As we can see, the AVPU Scale has its limitations. Let us examine another scale that can better incorporate some of these complexities, called the Glasgow Coma Scale.

The Glasgow Coma Scale (GCS) is more precise than the AVPU Scale by generating a score grade based on multiple parameters. The Glasgow Coma Scale generates scores between 3 and 15, with 3 being the worst and 15 being the best, based on three parameters: eye response (E), verbal response (V), and motor response (M).

The score for eye response examines whether the patients are opening their eyes spontaneously or to a stimulus. The verbal responsiveness score is about how well the patient answers our questions. The motor response score indicates how well the patient obeys commands and moves their limbs.

The parameters of the GCS are recorded individually and add up to the overall GCS score. For example, E2V3M4 results in a GCS of 9. GCS is a much more precise scale with less ambiguity than the AVPU scale.

Limitations of the GCS Scale

The trouble is, this scale requires us to remember 15 different types of questions and their responses. This scale is necessary if we continue to educate ourselves in medicine because of its precise nature. However, in the case of a wilderness first aid course like this one, it is not practical.

Paying attention to Mental Status

For a WFA course, we focus on one thing when understanding the patient's mental status: paying attention to them. That is what is paramount. A number would be nice, but paying attention to the patient is the most important thing we can do.

Notice if the patient is a little woozy, starts asking repetitive questions, or is not remembering things as clearly as they used to. Detect if the patient starts complaining more or gets lethargic. Those are all mental status changes.

Suppose we can focus on the patient's mental status on a minute-by-minute or second-by-second level by continually interacting. In that case, we can be ahead of the game when it comes to stopping the progression of disease processes and managing our patients moving forward.

Patient Assessment Review

Remember what makes wilderness medicine different from urban-based medicine: time-to-definitive care. Perhaps we can provide definitive care, but if we can not, we learned that wilderness first aid addresses what we, the first to respond, do until we can get further help.

We learned that the primary assessment confronts the emergency, and the goal of the primary assessment is to ensure the patient will not die on us in the next five to ten minutes. If we find a life threat, we manage it immediately and do not move on to the secondary problems.

We learned that if the patients do not have life-threatening problems, we take a deep breath, relax and move into the secondary assessment. The secondary assessment is our chance to find everything clinically wrong with the patient and the answers to all that ails them.

We learned that in secondary assessment, we perform physical exams, ask essential questions, and collect information to help us make a diagnosis. When asking questions, we use OPQRST, gather a SAMPLE history, and listen intently to the answers.

We learned how to obtain vitals and their purpose in the overall goal of treating our patients.

We recognized mental status as the window into whether the patient is getting better, worse, or staying the same and whether we need to adjust our treatments or evacuate them sooner.

Finally, we learned not to let spinal injuries paralyze us.

Be sure to review the material continuously as we seek more and more adventures. Never stop reviewing.

Trauma

Introduction - Trauma

This section will discuss the traumatic injuries we may encounter while enjoying the backcountry. Trauma is the number one problem we will see, and we will discuss those types of traumatic injuries that will most affect our outdoor experience.

First, we will discuss sprains, strains, fractures, and dislocations and how to diagnose, treat and manage them both in the emergent phase and over the long term.

Second, we will go over head injuries, diagnosing them, what they mean and how to manage them.

Third, we will discuss chest trauma, specifically rib fractures, and any underlying problems they may cause.

Fourth, we will discuss traumatic problems that can occur to the organs of the abdomen.

Fifth, we will discuss specific soft tissue injuries.

Finally, we will discuss the diagnosis and treatment of blisters, burns, and frostbite.

Orthopedic Injury

Incorrect Orthopedic Injury Assessment Techniques

Before we look at how we treat sprains, strains, fractures, and dislocations, let us look at a few incorrect assessment techniques often used to diagnose orthopedic injuries.

Swelling

People think that fractures may swell more, and sprains, strains, and dislocations may swell less - or vice versa. That is not the case. Swelling does not indicate the type of injury; swelling only indicates the extent of an injury. Do not use swelling as a diagnostic tool.

Bruising

Bruising is the same as swelling. Some injuries may bruise more or less than the other injuries. Bruising is non-diagnostic and only tells us the extent of the injury.

Movement

Often people respond to an injury by asking whether the patient can move the injured body part. If the patient can move it, they declare it is okay. Being able to move something or unable to move something is a non-diagnostic tool.

Swelling, bruising, and movement in conjunction with all other findings can be helpful, but do not use them alone for a diagnosis.

Circulation, Sensation, and Motion (CSM)

We use CSM to assess sprains, strains, fractures, and dislocations. CSM stands for (C) circulation, (S) sensation, and (M) motion. Everything we do regarding sprains, strains, fractures, and dislocations is about maintaining or regaining circulation, sensation, and motion. Think about this as an equation: $C + S = M$.

Circulation

When checking for circulation, do not check at the injury site; instead, we look for it far away, or distal, from the injury. For instance, if we have a possible fractured forearm, we check circulation down in the wrist.

While the gold standard for checking for circulation is the pulse, checking for a pulse at the foot with an injury to the leg can be difficult, especially after putting a splint on it. We can utilize two pulse points in the foot: the dorsalis pedis on the top center of the foot and the posterior tibialis on the inside of the leg between the achilles tendon and the “ankle bone.” However, there are other techniques we can use, like skin color, temperature, and capillary refill.

To test capillary refill, squeeze the nail bed and let go. It should turn from white back to pink relatively quickly. However, it is a rudimentary tool that does not work for people with poor circulation, when it is cold, or if someone has nail polish and is not the most accurate in children.

Sensation

We test sensation to test for nerve function. Again, we check it distal to the injury site. We can ask a patient if they can tell which finger or toe we are touching and whether they can feel something sharp versus something dull. All of these are indicators of nerve function.

Motion

To check for motion, we ask whether a patient can move the injured body part or the area distal to the injury. Remember, while movement is non-diagnostic, it does tell us that the patient has good circulation and sensation. Referring to the equation $C+S=M$, if a patient has both circulation and sensation, then movement will confirm those two.

CSM are the most important thing when assessing orthopedic injuries; everything we do to treat these injuries is to regain or maintain CSM.

Splints

Placement

When putting on splints, always think about what we are trying to support.

If there is an injury to a bone, we need to ensure that we support the joints above and below. If we allow those joints to flex and extend, the worst-case causes more damage, and best case, it is more painful for the patient.

Try this out. Grab your forearm and flex and extend the wrist. You will feel the muscles moving around in the forearm. Imagine a patient with a broken forearm bouncing down the trail without support for the wrist or elbow. We must ensure that we immobilize the joints to keep the bone stabilized.

If the injury is to the joint, we want to support the bones above and below. For instance, an elbow injury requires us to support the bones above and below the elbow. If we do not lock these two together, the joint will be able to move, and in the worst-case case causes more damage, and in the best case, it will be more painful for the patient.

Now that we have stabilized the joint or bone, we need to remember that we have to get this patient evacuated. All evacuations require the patient to move, whether it takes five hours or five days and whether they are walking out, carried out, or flown out. We want to ensure stabilization of the injury site. We have already stabilized the bones or the joints, and we now need to stabilize the whole thing together.

We do this by stabilizing the injury to the body or another body part. We have got to keep this injury from moving around. The less movement we have, the better the outcomes for the patient.

Padding

Padding is our friend, and we want as much padding as possible when splinting sprains, strains, fractures, and dislocations. People often take this class to learn how to put two sticks and a squirrel together and make a splint. Ideally, this class teaches how to assess injuries, know the appropriate treatment, and what it means to have a well-stocked first-aid kit with the appropriate materials for making a good splint.

Rigid materials can cause pressure points on and around the injury site. Again, padding is our friend as it provides compression by squeezing it around the site, reducing pressure points, and providing excellent stabilization.

A pillow makes an excellent splint because we can compress it around an injury site and tie it up with little to no pressure and good stabilization. Similarly, sleeping bags, clothing, and other soft, compressible material work great. However, a padded splint will only be as good as the ties that hold everything tightly together.

Accessibility

Make sure we can access the injury site. We will need to reassess the injury; continual access is critical. Do not tie it up so that we have to cut it all apart later. All that means is we have lost all the materials and need to rebuild the whole thing with materials we might have already used. Please make it so the splint easily opens up and can be put back together. When tying knots to compress the padding or stabilize the splint, simply use standard overhand knots that are easy to tie and untie.

Long-term monitoring

Make sure to reassess the injury and the splint continuously. Remember, we are endeavoring to maintain CSMs. If we think back to our first discussion about what makes wilderness first aid wilderness first aid, it is about time to definitive care.

We might be with a patient with a fracture or dislocation for several days. We want to ensure that we are constantly reassessing this injury site to ensure they have good

circulation, sensation, and motion. If they do not, or if something changes, we need to stop, go back to our assessment, re-do everything and try to figure out what went wrong.

Materials

A good splint has good materials coming out of our first aid kit. Just like having a good tent, backpack, and boots, we must prioritize a first aid kit that minimizes the need to improvise. The following are the necessary items for orthopedic injuries in any first kit.

Foam Splint

Bring a foam splint that is malleable and bendable, but when we put a little bend into it, it becomes rigid. We can use this to create splints for legs, ankles, arms, or anything else.

Roller gauze

Have roller gauze. A minimum six-inch wide gauze allows us to apply the foam splint and wrap it up, making building the splint more manageable.

ACE wraps

ACE wraps are excellent. However, one of the downsides to these elastic bandages is that they can often become too tight. So be sure to think about how we are applying it. Nevertheless, a nice big one, at least six inches wide, can do a great job wrapping a splint.

Medical Tape

Ignore metal clasps that arrive with a standard first aid kit; they will not hold anything. What we want is tape. We want a minimum of two-inch medical tape on patients, used with splinting material, and easily rippable.

Triangular bandages

Often called cravats, triangular bandages provide the ability to create slings that hold an arm in place or swaths that can tie stuff together again. We want nice wide, big ones.

They can be purchased or easily made with extra sheets or materials at home, but it has got to be cotton because synthetic materials have too much stretch.

A well-stocked first-aid kit is a must, and it will make all the difference regarding sprains, strains, fractures, and dislocations.

Head Injury

First, we want to differentiate between head wounds, meaning cuts on the head, and head injuries causing underlying brain trauma. In this course's soft tissue injuries section, we will discuss head wounds and wounds in general. This section is about head injuries resulting in brain trauma.

Head injuries are very concerning. One overriding factor that guides everything else we are going to do is a mental status change. A patient involved in an incident with known or suspected head trauma and known or suspected mental status change at the time of the incident or post-incident requires immediate evacuation. We have no way of thoroughly assessing the extent of the brain trauma or managing brain-related traumatic injuries in the backcountry.

Head trauma can get easily overlooked. We have all heard the phrases, "they had their bell rung," "they are seeing stars," or "it is a minor concussion." Those are not good sayings, and that is never how we want to approach a head trauma patient. If a patient has an incident resulting in head trauma with known or suspected changes in mental status, it is an immediate evacuation. Get them out.

Head injuries are bad because our cranium, the skull, has a finite amount of space inside, which is under constant pressure. The brain is susceptible to any minor changes, pressure being one of them, and we have to maintain constant pressure to ensure good brain function.

If that pressure changes, things can go wrong quickly, especially if that pressure goes up. We must consider whether there is a possibility of ruptured blood vessels in the brain or the membranes surrounding the brain if we have a patient with head trauma. As blood starts to fill up the skull, that pressure increases, and as that pressure increases, it starts to put pressure on the brain, which will have dire consequences.

Let us move through some patient progressions. A patient progression is the advancement of the patient through the required care events, actions, and processes to achieve a health status so the patient can safely and appropriately transition to a lower level of care.

Concussion

First off, let us address concussions. For the sake of this course, we need to forget the term concussion altogether. A concussion is a medical diagnosis that needs to be made based on precise criteria. Concussions range from mild to extreme, but we cannot diagnose the severity of a concussion in the backcountry.

Think of head trauma instead. They had an incident where they whacked their head, and we do not know the extent of the trauma.

Also, if we say it is a concussion, the tendency is to minimize it, which means we do not give it the proper attention. In contrast, head trauma sounds like it deserves attention. Instead, we need to consider any patient who whacked their head as having head trauma and assess and monitor them for related brain injuries.

Open Head trauma and Closed Head Trauma

There are two types of injuries to the head: open head trauma and closed head trauma. Remember that we are focusing on underlying brain injuries in this section. In a later section, we will learn more about managing the soft tissue injury that may come with open or closed head trauma.

Open head trauma refers to a cracked skull open to the atmosphere. When assessing someone's skull to see if they have an open cranial fracture, we must feel and squeeze the head. Many describe the sensation as boggy, like fingers pushing on moss. If we feel that, stop; we know we found the injury, do not keep pushing. If we examine the head and notice the brain exposed to the air, we know we have an injury and do not need to tickle their brain and see if we can get their left arm to move. We have found the injury.

Closed head trauma means they have not fractured the skull, and the injury is internal with no external signs. In this case, we are looking for mental status changes.

Any person with head trauma needs constant monitoring for mental status changes.

D.I.C.C.

One of the things that we think about with head trauma is how this person might act. We use an acronym called D.I.C.C, which stands for Disoriented, Incoherent, Confused, and Combative.

Disoriented: When disoriented, the patient might not know what is going on, including an inability to recall events, lack of certainty about their surroundings, or unable to remember their name. A common finding is a patient who asks repetitive questions and cannot recall the answers.

Incoherent: When incoherent, they might be mumbling words, using inappropriate words, or making no sense as they speak.

Confused: When confused, they cannot think clearly or seem bewildered.

Combative: When combative, patients tend to get angry and aggressive.

When found after a precipitating event, these are all signs of head trauma, and they can range from mild to severe.

Breathing

Their breathing pattern may change as the pressure inside their skull increases due to a blow to the head. They go from breathing regularly to irregularly, rapid to slow, deep to shallow, or all over the place. By the time breathing patterns change, the trauma has progressed pretty far.

Pupillary Changes

Finally, we look for pupillary changes where their pupils change and do not react the way they usually would. Pupillary changes are an extremely late sign. When head trauma has caused pupils to change, we know that the pressure inside the skull is exceptionally high. Please do not wait for someone's pupils to change before deciding they have head trauma. The classic sign is one standard-sized pupil and one pupil that is blown or very big. If we see that after an incident, we know things are wrong, and we must move quickly.

As mentioned, the most crucial thing we can pay attention to when it comes to head trauma is mental status changes. It is an immediate evacuation if we have known or suspected mental status changes.

However, there is potential to run into situations where the person who has an incident does not have immediate or delayed mental status changes. In this case, we need to monitor them.

Sleep and Head Injuries

One common belief is not allowing someone to sleep after head trauma; this is only partially correct. It is not valid if it is bedtime and the patient is ready for bed. It likely will

not make sense to try and stay up for the next 24 hours since they will probably be tired. However, if we let someone sleep for the next eight hours, we can not monitor them.

A solution might be to let them sleep but wake them up every hour and ask them questions to ensure they do not have any mental status changes. If their mental status never deviates from their baseline and all other assessments are within normal limits, perhaps we can keep going.

However, as we monitor them over the next hours or days and their mental status changes, we get them out. Ultimately, if the pressure continues inside their skull, they can herniate their brainstem out the bottom of their skull and die instantly. We do not want that to happen.

Unfortunately, there is no treatment for brain-related trauma in a backcountry setting. We are going to treat the signs and symptoms. If the patient is having a hard time breathing, we are going to support their breathing. If they are disoriented or falling, we will not let them walk and will carry them out. We cannot do anything beyond that. We monitor, watch for mental status changes, and evacuate them. That is all we can do. Please do not think we will take a Swiss army knife and do a borehole into their skull. We do not do that. We will monitor and provide palliative care and, hopefully, get them to definitive care as soon as possible.

Chest Trauma

Before getting into the kinds of chest injuries that can occur and what we might have to deal with, we need to understand why we are driven to take a breath and how we go about breathing.

Why We Take a Breath

We are driven to take a breath due to the acid levels of our blood, not due to our oxygen levels. The amount of carbon dioxide in our blood, which affects our blood's pH, will stimulate our respiratory drive. We have receptors in our brain stem, called

chemoreceptors, which hang out in the bloodstream. As the blood passes, the chemoreceptors measure the pH to maintain a precise range.

If the pH range changes, either too high or too low, our breathing speeds up or slows down. When we breathe in, we take in oxygen; when we breathe out, we blow out carbon dioxide, a weak acid. Therefore, our respiratory drive is based on maintaining the optimal pH range.

How We Breathe

Breathing is a mechanical activity. When we breathe, our diaphragm contracts or drops down, and the muscles in the chest, the intercostal muscles in between the ribs, cause the chest to open up. Our chest cavity is a closed space with only one way out, and the pressure goes down when we have a closed space and make it bigger.

So when we breathe, and our chest cavity gets bigger, the pressure inside the chest cavity is now less than atmospheric pressure, and air rushes in.

When we breathe out, our diaphragm relaxes or comes up, our chest walls contract in, the intercostal muscles squeeze down, and the pressure inside the chest cavity is greater than atmospheric pressure, thus pushing air out.

That is how we breathe or move air in and out. It is all about pressure, and we must understand that for some components of what we will discuss. It also comes in handy with breathing problems a little later on.

Rib Fracture

We will start with a simple rib fracture, the easiest chest trauma to treat.

Anyone who has ever had a rib fracture knows they are extremely painful. Usually not deadly, usually not that dangerous, but very painful.

A simple rib fracture is when one rib on one side is fractured. If it is a simple fracture, there is little danger here.

The trouble is that it hurts to breathe, and every breath the patient takes causes the rib to move and hurts. We will discuss punctured lungs in a moment, but for now, breathing pain is the only problem with a simple rib fracture. So the solution for a simple rib fracture is palliative care and helping the patient find comfort. If it helps the patient by putting something around it, that is great. If it helps to keep it free, that is great too.

We do want to monitor their breathing and ensure they are not working too hard to breathe. If the patient's breathing becomes labored, we know that something has progressed, and at that point, we have to manage that progression. We will discuss the next steps momentarily.

Multiple Rib Fractures

We may encounter multiple rib fractures. Again, this is usually not deadly, but it indicates more force involved in the incident. At this point, we must be much more careful about other underlying problems. However, it can be just rib fractures if we assess the patient and do not find anything besides multiple fractured ribs.

Even if we assess the patient and determine that it is just multiple fractures, we will likely end our trip and evacuate this patient. As in the case of a single rib fracture, all we can provide is palliative care. We can monitor their breathing, support them however we can, and keep them comfortable, with the ultimate goal of getting them further help.

Flail Chest

A flail chest injury is a true emergency and a potential life threat. A flail chest is when two or more contiguous ribs fracture in two or more places.

For instance, feel for two ribs on one side of the body and differentiate one from the other. A multiple rib fracture will be if we fracture each of those ribs in one place on each

of the two ribs. A flail chest is when we fracture both ribs in two or more places on each rib.

A flail chest is harmful because it will severely restrict breathing and change the breathing mechanism we identified earlier in this section. Remember, when breathing, everything relies on the right amount of pressure. With a flail chest, pieces of the ribs no longer attached to the rest of the rib cage will move independently of the rest, compromising the chest's structure.

Remember that every time a patient breathes, their chest expands. When the chest expands, the decrease in pressure in the chest sucks in the fractured rib segment. When they exhale, the rib segment pushes outward with increased pressure. They call this movement paradoxical, meaning it moves the opposite way we expect.

This injury will be apparent. When examining the patient's chest, we can see this rib segment moving in the opposite direction of the chest as they breathe in and out. A flail chest is a life-threatening emergency. In addition, there is a high potential for other underlying chest injuries. Evacuate the patient immediately.

Pneumothorax

There can also be a problem with air inside the chest cavity called pneumothorax - 'pneumo' meaning air, and 'thorax' meaning chest cavity. Air in the chest cavity is problematic because air belongs in the lungs, not the chest cavity.

Understanding that the organs inside our bodies have membranes surrounding them is helpful. Think about our organs and our body cavities like Ziploc bags. Each organ in our body, like the lung, is inside a small Ziploc bag sitting inside another big Ziploc bag we call the chest cavity. If air enters the chest cavity, the air pressure between the big Ziploc bag and the small Ziploc bag increases, which causes unwelcome pressure on the small Ziploc bag and the organs.

Simple Pneumothorax

A simple pneumothorax can happen spontaneously or from trauma to the lung. We know a patient has air building up inside the thoracic cavity when they present as anxious, nervous, and having increasing difficulty breathing. Breathing will get harder and harder as the air inside the thoracic cavity increases.

We will want to assess so we can diagnose the problem, but there is nothing we can do except provide palliative care. A simple pneumothorax needs monitoring; if it progresses and breathing worsens, evacuate the patient.

Tension Pneumothorax

If the air can not escape and builds up in the cavity, we call it a tension pneumothorax. When this happens, the air has added so much pressure inside that thoracic cavity that it “collapses” the lung. A collapsed lung is not a deflated lung but a lung that can not expand.

With air building in the chest cavity outside the lung, in between those two Ziplock bags, it is pushing on the lung so that it cannot expand and can not get air into the alveoli, thus limiting gas exchange.

We know a simple pneumothorax has progressed into a tension pneumothorax when the patient has increased difficulty breathing, is more anxious, and is noticeably working harder to move air in and out.

As a tension pneumothorax progresses, we will see differences in chest rise where the side of the chest with the tension pneumothorax will not expand as much as the other side.

The next progression is when the trachea slides over and away from the injured side. Do not wait for this sign as this is very late to appear.

Unfortunately, there is nothing outside monitoring and supportive care that we can do about this in the field. We can, however, recognize that it is happening and get this patient to definitive care.

Sucking Chest Wound

The last injury we want to talk about is a sucking chest wound. A sucking chest wound is when something comes externally and pokes a hole through the chest cavity, and it can either go all the way into the lung or just into the chest cavity. Using the analogy of the Ziplock bags, it can just pierce that outside bag or all the way through and pierce both bags.

Now we have a hole in the patient's chest wall. Because we breathe based on pressure, the air gets sucked in through this hole into that cavity every time they breathe, and the air starts to build up pressure inside the bag.

We need to stop air from entering this hole because every time they breathe in, we increase the air pressure inside that cavity. To do this, we are going to use an occlusive dressing.

An occlusive dressing is waterproof, air-tight, and often a plastic bag or wrapper. A first aid kit could include a commercial-grade device, but all we need is something that will block air from entering that cavity completely. Do not hesitate to evacuate a person with a sucking chest wound.

As the problem progresses, even with an occlusive dressing, they may still develop a tension pneumothorax. For instance, if the patient has punctured their lung, air will continue to escape from that lung into the cavity. The nice thing, if it could be called a nice thing, about a sucking chest wound is that we have an escape hatch for that air.

If we notice this patient starting to have increased difficulty breathing or their work of breathing is increasing, we can take that occlusive dressing, open it up and burp it. Some bubbling might come out of the wound, but we can let the air escape and put the dressing back down.

Be sure to monitor the patient with chest trauma continuously. Whether it is simple rib fractures, multiple rib fractures, flail chest, pneumothorax, tension pneumothorax, or sucking chest wounds, pay attention to their breathing and evacuate immediately.

Abdominal Injury

Moving to the abdomen, we will discuss traumatic abdominal injuries caused by external forces.

In the backcountry, there is nothing more than palliative care that we can do for internal injuries resulting from trauma to the abdomen. Traumatic abdominal injuries will require surgery, or at least imaging, to discover what is happening. In the meantime, we can monitor the patient, watch for complications, watch for worsening, treat the symptoms, and evacuate them.

To understand traumatic abdominal injuries, we must understand the types of organs in the abdominal cavity. In this case, there are two types of organs: solid and hollow.

Solid Organs

Solid organs are organs like the liver, pancreas, spleen, and kidneys. Solid organs have many vessels carrying considerable blood, and bleeding out makes solid organ ruptures incredibly dangerous.

Bleeding out does not always mean bleeding out onto the ground. These organs can bleed internally since the body contains cavities where the blood can collect. For instance, the pelvic cavity can hold four to six liters of blood inside without losing any blood outside. The femoral cavities can hold two to four liters of blood in each.

Depending on the patient's size and gender, the typical person has five to seven liters of blood. Therefore, a person could potentially bleed out all of their blood volume inside their body cavities.

We know someone has potentially ruptured a solid organ or is bleeding internally into their abdomen based on several factors. Bruising will be the best indicator, and we look for signs of it on the abdomen, flanks, and back.

We can also look for distension, meaning the abdomen is getting bigger. Distention may cause rigidity, where the abdomen becomes hard to push on.

After a traumatic event to the abdomen, be on the lookout for potential bleeding with these two signs, and if found, get the patient out and seek further care.

Hollow Organs

Hollow organs are organs like the bladder, stomach, gallbladder, and intestines. The hollow organs contain waste products; if we rupture them, waste will leak into the abdominal cavity. There may be some bleeding as well, but bleeding is a secondary concern.

When it comes to hollow organ rupture, we are concerned about infection. There is potential for developing sepsis, or whole body infection, in someone with a traumatic injury to the abdomen with a ruptured hollow organ.

We discuss infections in further detail in soft tissue injuries, but along with vital signs and mental status changes, the main sign of sepsis will be fever. Besides a fever, we may also see bruising and swelling with a hollow organ rupture.

With any abdominal problems, if we suspect anything more significant than just a surface bruise with abdominal trauma, evacuate the patient immediately. There is not much we can do besides palliative care.

In review, the solution for a traumatic abdominal injury is assessing and taking care of the patient, making them comfortable, monitoring them, and getting them out.

Soft Tissue Injury

Anyone spending any time in the backcountry will inevitably have to manage soft tissue injuries. The most common medical issues in the woods are cuts, scrapes, and burns, and this wilderness first aid certification will be the most useful when dealing with soft tissue injuries.

The most important thing about soft tissue injuries is understanding how to treat them because diagnosing them is not that difficult. So this section will start with treatment and finish with diagnosis.

Non-Life-Threatening Bleeding

With a soft tissue injury, always stop the bleeding first. We stop bleeding with direct pressure, which will stop most of the bleeding we encounter. Ideally, the patient holds pressure on the wound so we can perform other duties.

Bleeding can look bad, like a wound on someone's scalp that bleeds like in a horror movie; however, do not get hung up on how it looks. Often we wipe the blood away and find only a tiny cut. Our bodies will start clotting in about two to three minutes. Most of the time, with direct pressure, the bleeding will stop.

However, we might get wounds that continue to bleed even with direct pressure. In this case, put on a pressure dressing. A pressure dressing is held on by something other than someone's hands. We could use an ACE wrap, a gauze pad, a bandaid, or a gauze dressing to keep pressure on the wound.

If the dressing soaks with blood, take it off, and put on a new one. The idea of leaving the pad on and putting other ones on top is wrong. If the dressing soaks with blood, remove it. Do not worry about removing the scab starting to form or the clot that's starting to form. If it is still bleeding, there is no clotting. Take it off, and put on a fresh one.

Life-Threatening Bleeding

Another type of bleeding we might encounter is bleeding that will not stop with direct pressure. Life-threatening bleeding will be bright red blood gushing or pumping out of the wound; a tourniquet is the only way to stop this type of bleeding.

Tourniquets

Many of us fear using a tourniquet, and please do not. Tourniquets are great devices that save lives.

The fear is that putting a tourniquet on, say, a patient's arm, there is a chance they might lose their arm. First, think about the alternative. The patient has life-threatening bleeding, and if we do not put on the tourniquet, they may lose their life. Second, tourniquets can stay on for a long time before we have to start worrying about losing a limb.

Proven by research, tourniquets decrease the morbidity and mortality of patients and decrease complications with the wound and the chance of dying. If there is life-threatening bleeding, put a tourniquet on, leave it on and get them to definitive care.

It is unlikely we will see a patient in need of a tourniquet. For the most part, direct pressure is all we need. Once we have stopped the bleeding, we get to the essential step for wound care: cleaning the wound.

Cleaning Wounds

Cleaning wounds is one of the main things that differentiate how we handle soft tissue injuries in the backcountry versus the front country. In an ambulance, the standard is to stop the bleeding, dress and bandage the wound and take the patient to the hospital for care and cleaning.

In the backcountry, it is on us to care for and clean the wound. In the backcountry, thoroughly cleaning a wound can directly affect whether we need to evacuate the patient or we can keep the trip going, whether the wound becomes infected or heals. Cleaning wounds is an essential component of wilderness medicine, and so is recognizing the signs and symptoms of infection and complicating factors.

People think the items used to clean wounds are likely sitting at home in our medicine cabinet or drawer. Items like alcohol, hydrogen peroxide, or betadine/iodine. Throw all of them out.

In the backcountry, if the water is drinkable, it can clean a wound, and we only clean wounds with water, and we do not need to add anything else. In fact, only water is used to clean wounds in a clinical setting like an emergency department or an operating room.

In order to properly clean soft tissue injuries, we need pressure, and the best way to achieve this is with a large syringe. This syringe allows us to get pressure into the wound by pulling up a good quantity of water, skillfully aiming the tip at the wound, and irrigating it properly.

Many people worry about wasting water. Use discretion, but know that cleaning the wound needs lots of water and pressure. Dirty wounds become infected, infections complicate patient care and recovery, and require patients to be evacuated.

Again, we clean the wounds with water and do not clean them with hydrogen peroxide, iodine, alcohol, or anything in our medicine cabinet. We will never see a medical provider in an ambulance, an emergency room, or a hospital cleaning wounds with anything but water. Anything but water is cellular toxic and will kill everything, including the healthy tissue surrounding the wound. When the healthy tissue is damaged, it retards the healing process. Stopping the body from healing, prolonging the wound exposure, and increasing the possibility of infection. That means the wound will stay open longer and more prone to infection. Cleaning with anything but water does the opposite of what we are trying to accomplish.

Dress and Bandage

Next, we dress and bandage the wound. The difference between a dressing and a bandage is that a dressing goes on a wound, and a bandage holds a dressing in place.

A good backcountry first aid kit must have many dressings and bandages to properly treat soft tissue injuries and continually change the dressings and bandages. A proper first aid kit will be 60% or more dressings and bandages.

Most people will have small 2" by 2" dressings, which will not do. We want 4" dressings. For bandages, 6" roller gauze is what we want. Make sure to have enough roller gauze to wrap up this whole thing. Like in splinting, we are most concerned with ease of application and functionality, not about form or looking pretty. It needs to work.

Another product to consider is Tegaderm film. It is breathable but waterproof and lets light into the wound. Air and light are the enemies of infection, and Tegaderm provides both while keeping the wound dry. Practice with it to learn how to use it correctly.

When adding band-aids to a first aid kit, make sure they are big Band-aids. Not small 1" Band-aids; we want a minimum of 2" Band-aids.

Monitoring Wounds

Once the wound is dressed and bandaged, it is time to monitor for long-term care. We are going to monitor a couple of things.

First, we must make sure we are changing our dressing and bandages. We change at least two times a day in the morning and evening or whenever it becomes wet, dirty, or blood-soaked. Please do not set it and forget it. We have all left a band-aid on for multiple days only to discover skin underneath all wrinkled and unhealthy.

Keeping wounds clean and changing dressings and bandages frequently will allow a trip to continue versus having to evacuate if we are in the backcountry.

Local Infections

When watching for signs of infection, we look for two types. The first is a local infection when the area around the wound becomes red and warm/hot, increases pain, swelling, or shows pus production, and these signs indicate a local infection.

To treat a local infection, we need to get rid of that infection. If the wound has closed up or has sealed over, we might need to open it back up. This scenario is an excellent use of alcohol wipes or hand sanitizer to sanitize the blade of a knife to open up that wound.

It is okay if it bleeds a little bit as long as we push the pus out. Once done, clean it, dress it, bandage it and stay on top of it. If the infection lingers, it means that the patient is more prone to infections, we have not been changing the dressings and bandages as frequently as we should, or something else is happening. Be sure to keep monitoring.

Systemic Infection

A systemic infection happens when a local infection is improperly cared for and spreads to the body. A systemic infection will be an evacuation because this person needs antibiotics and a hospital.

We are looking for one or both of two things with a systemic infection. The first is a fever secondary to a wound, and the second is red streaks from the wound moving towards the body. For instance, if a wound is on the patient's arm and we start to see red streaks moving up the arm towards the body, we know this is becoming a systemic infection.

Wound care is relatively straightforward, clean the wounds and stay on top of them.

Wound Size and Location

Sometimes, even if the wound is not infected, we want to consider evacuation. The type of wound - puncture, impalement, avulsion, or laceration - matters less than what we discover in evaluating these wounds.

We want to evaluate the wound's depth, width, and length, to help us decide whether the patient needs further care; the more significant the wound's size and depth, the more definitive care the patient will need.

Also, consider the location or area of the wound. Wounds on some regions of the body cause lifelong problems if not brought immediately to definitive care. Those areas are wounds on joints or if wounds expose bone, muscle, or tendons.

Antibiotic Cream

Antibiotic creams are ubiquitous and sold in a way that implies they can be put on all wounds to prevent infection and scarring, but that is not the case. They are only meant for abrasion or surface area injuries and are usually unnecessary. The only reason they exist is because of poorly cleaned wounds. Washing the wound and changing the dressing and bandages are required regularly.

Wound Closure

There are two factors to consider with wounds and antibiotic cream like Bacitracin. First, people put them in deep cuts to prevent infection. Instead, this creates a dark, warm,

moist pocket that allows bacteria to grow, thus accomplishing the exact opposite of preventing infection.

Second, we are concerned about wound closure. Closing wounds can be good, but how and when to close matters. Properly sealing wounds is a must, and improperly closing can create a dark, warm, or moist spot prone to infection.

For instance, take a big wound requiring stitches in an urban setting. In this case, we bring the patient to an emergency room where a doctor would stitch the wound layer by layer, so there is no pocket. The problem is that we do not stitch in the backcountry.

Sometimes, we have butterfly or wound closure strips to seal the wound together. The problem is that closure strips create areas for bacteria to grow. Closure strips are not wrong when applied correctly. To apply them correctly to a gaping wound, take the strips and bring the edges of the skin close together but not closed. The wound must be open enough for air and light to circulate and prevent infection.

Finally, if the patient has an animal bite, never close this type of wound. Animal bites are highly prone to infection. Puncture wounds are already susceptible to infection, but the bacteria from an animal's mouth cause additional concern of infection. Like any other wound, clean it thoroughly.

If considering closing wounds, clean them thoroughly, dress and bandage them properly, and evacuate to seek further help. We will most likely spend our time doing wound care for first aid in the backcountry, so be sure to understand how to evaluate and treat them properly.

Blisters, Burns, & Frostbite

This section will address burns, blisters, and frostbite. These soft tissue injuries are managed differently from common soft tissue injuries.

Burns

There are different types of burns: chemical, thermal, and electrical. In the backcountry, typically, we see thermal burns from hot water or fire.

When assessing burns, we perform several evaluations to uncover the burn's type, degree, and extent. As mentioned, the type of burn we typically see in the backcountry is thermal burns.

When discussing the degree of the burn, there are three levels many are familiar with: first degree, second degree, or third degree. We try to avoid those terms because no one can remember which was worse, first degree or third degree. They are now called superficial, partial thickness, or full-thickness burns.

Superficial Burns

An example of superficial burns is sunburn. Any superficial burn will look like a sunburn where the skin is red, angry, hot, dry, and hurts. There is no immediate life threat in a superficial burn. Over the long term, there is skin cancer, but in the short term, there is no life threat.

Aloe is the best for managing a superficial burn. Additionally, keep the patient hydrated because the skin helps regulate the body's water balance, and with a burn, it will have a hard time doing so.

Partial Thickness Burns

A burn goes from superficial to partial thickness with the formation of blisters. Blisters mean that the burn, or the heat from the burn, has moved deeper into the tissue, and more burning action has occurred deeper into the body.

Tissue can hold heat exceptionally well. Therefore, we need to remove all the heat as soon as possible. For instance, when anyone grabs a hot pan off the stove and burns their fingers, they typically go to the sink and put it under cold water for 20 seconds. Sure, it effectively cooled it off, but 2 minutes later, it hurts again because it takes 20 to 30 minutes to remove the heat from the skin. It does not have to be ice water; anything colder will withdraw all that heat.

Upon removing the heat, we address the injury. First, remove any restrictive clothing or jewelry from the area. Depending on the severity of the burn, there may be swelling. Treat it like a wound by dressing it and bandaging it.

Do not scrub or pop the blisters. Leave everything intact with wounds from burns. Popping and opening the blisters causes fluid imbalances and infection.

So keep everything intact, wrap it up, and consider evacuation. The consideration around evacuation will depend on how much of the body is affected.

Full Thickness Burn

A full-thickness burn occurs when the heat has moved through the tissue and potentially into muscle and bone. All full-thickness burns must be evacuated.

Full-thickness burns will be insensate, meaning there is no pain at the burn site. This does not mean the patient will be without pain because surrounding this full-thickness burn will be partial thickness burns where there will be pain. Full-thickness burns will also have charring, depending on the burn or skin type. Full-thickness burns are truly dangerous.

Treating a full-thickness burn is like treating a wound, but we are not popping or scrubbing anything again. We remove the heat, dress and bandage it, and evacuate the patient.

Burn Extent

There are many ways to estimate burn extent on a patient, but the simplest is to use our palm. Since the surface area of our palm is 1% of our total body surface area, we can use the palm as a rough estimate, i.e., four palms equal 4% of their body burned. Getting a percentage of burnt body surface area is crucial because it dictates further actions.

One action is whether to evacuate. As stated, in the case of full-thickness burns, regardless of the extent, the patients are evacuated. For a partial thickness burn, we evacuate where an extent is more than 15% of the body surface area. It does not require a helicopter, but it does mean an evacuation to the front country.

Airway Burns

With some burns, there might be some soot or a dusky appearance around the nose and the mouth. These are genuinely life-threatening emergencies, and evacuation is paramount. If an airway gets burnt from inhaling hot gasses, that airway will swell and close off, and there is nothing we can do about it.

Burns Requiring Evacuation

All full-thickness burns require evacuation. Full circumferential burns need evacuation. Airway burns, as mentioned. Any partial-thickness burns on the hands, feet, face or genitalia require evacuation. It does not mean they are life-threatening burns, but the problem with burns to those areas is that they are necessary for daily, normal function. Furthermore, partial-thickness burns require specialized care and delaying care for burns to the hands, feet, face, or genitalia can have lifelong consequences.

Blisters

When discussing blisters, we are not discussing the blisters that form from burns. These are friction blisters we get on our feet from hiking or hands from paddling.

First off, do all that is possible to avoid blisters. It may seem obvious, but prevention is the best medicine for blisters, and it is not hard. For feet, wear boots that fit, keep feet dry, and rest regularly with boots off.

Recommend liner socks to anyone prone to blisters or for general blister prevention. Liner socks are thin socks to wear under regular hiking socks that create a slippery surface to reduce friction between the foot and the shoe.

One thing to avoid is using duct tape to prevent blisters. Many people use medical tape or other adhesive blister prevention material; that is fine. Use only medical tape designed to be placed on the skin; do not use duct tape.

When considering whether to pop or not to pop the blister, pop it. The blister will eventually pop, and we want to control when and how it pops. If the blister explodes in the middle of a hike, it creates an open and painful wound prone to infection.

To pop a blister, find it, put a pinhole, drain it and keep the skin intact. Do not remove that flap of skin; put on the preferred blister prevention method over the drained blister. Tegaderm works well here because it is breathable, super slippery, and waterproof.

Frostbite

Frostbite, like burns, has levels.

Frostbite can happen even when it is not freezing outside. People with poor circulation and generally uninsulated extremities can get frostbite in above-freezing temperatures.

Superficial Frostbite

We have superficial frostbite, aka frostnip. Anyone who has ever been in a cold environment has had superficial frostbite. Superficial frostbite is when the hands, nose, ears, or other body parts get numb, tingly, and painful, but everything is still squishy. When this happens, recognize that it is getting cold and get out of that environment to warm up.

However, by warm-up, we do not mean putting the hands or feet under hot water or over a hot stove. While it may feel good, albeit a little painful, this can cause little red dots all over the skin, called petechiae.

Those red dots are the exploded ends of capillaries. In essence, the cold causes vasoconstriction of our vessels, making them smaller. When going from extreme cold to extremely hot all of a sudden, the vessels expand rapidly, but the ends of the capillaries can not keep up and explode.

The problem with even minor petechiae is that it destroys microcirculation. The more the reduction in microcirculation occurs, the more prone to frostbite the patient becomes. Instead, put a hand in an armpit or on the stomach. Use a friend's body warmth for the feet.

Partial Thickness Frostbite

Partial-thickness frostbite is when the freezing has moved deeper into the tissue, where the water in our bodies starts to freeze, forming crystals. We have got to stop the freezing of water in the body from happening and hopefully reverse the process. Keep in mind, also, that crystals are sharp and pointy.

We can tell someone has moved from superficial to partial-thickness frostbite by noticing that the skin becomes much paler and almost waxy. We might even notice that some of the pain has started to go away. The key here is that the frozen part will still be squishy, and the skin will still be pliable.

If this happens, focus intently on rewarming them. The rewarming process can be excruciatingly painful and cause swelling. Like burns, remove any restrictive clothing or jewelry during the rewarming process.

Since the freezing process causes sharp and pointy crystals, we do not want to rub cold body parts. If we have frostbitten hands and start rubbing them together, we shove the sharp and pointy crystals into the walls of the cells, bursting the cells and causing more cellular damage. We never rub cold extremities. We can shrug our shoulders and use centrifugal force, but gentle rewarming is the best thing to do.

Gentle rewarming can happen with skin-to-skin contact or tepid water at the temperature for bathing a baby. We want to rewarm and allow the circulation to return slowly.

This process will be painful, but once rewarmed, the patient will be highly motivated to help figure out why it got cold in the first place to prevent it from happening again.

Full-Thickness Frostbite

At this point, we have frozen all the way through with full-thickness frostbite. We have all seen movies of people on Everest with their fingers or nose turned black, but that is not what we will see because that happens after rewarming the body part.

Instead, we will see a pale ghost white body part that is hard as a block of wood. This entirely frozen tissue is not painful at this point, and we will not know the extent of the damage until after rewarming. Despite common presumptions, full-thickness frostbite does not always mean the patient will lose that body part.

The difficulty with full-thickness frostbite is that if we rewarm it, we must ensure that it never freezes again in this particular time frame because it is worse to thaw something out and let it refreeze than it is to leave it frozen.

Imagine we take a steak out of the freezer for dinner, thaw it out, but decide on takeout instead and put it back in the freezer. Repeating this process two or three more times will cause the steak to be freezer burned. That is what happens to the full-thickness frostbite fingers. If it is frozen and we cannot guarantee that it will stay thawed before evacuation, leave it frozen.

Another consideration with full-thickness frostbite on the feet is whether the patient can walk out of the backcountry. If the best way to evacuate is on foot, leave it frozen, have them walk out, and then manage the patient throughout.

If the decision is to thaw out full-thickness frostbite on a patient, lukewarm circulating water for about 30 minutes is the best option. Expect it to be excruciatingly painful for the patient.

We can also dress and bandage to protect the frostbit area. If aloe is available, presoak the dressings in aloe before putting it on that frostbit injury. The aloe can help prevent some of the swelling.

The other thing we can do is use aspirin if the patient is not allergic. Aspirin may allow blood to flow through the frozen capillaries to provide a little blood flow and circulation to get out to that tissue. Ultimately, full-thickness frostbite requires expert care.

Trauma Review

In dealing with traumatic injuries, first, identify a precipitating event. If a patient did not fall, was not hit by something, or did not have some significant impact or incident, it is not trauma and eliminates a whole section of problems. When we question whether a patient fell or was hit and the answer is no, we know that without a precipitating event, we do not have a traumatic injury.

We discussed sprains, strains, fractures, and dislocations. Lower leg injuries are the most common injuries in the backcountry, particularly sprains. We learned how to diagnose a sprain, a strain, a fracture, or a dislocation, so be sure to evaluate thoroughly. Treat them properly and re-evaluate orthopedic injuries continuously, especially in long evacuations or when managing for extended periods.

With head trauma, do not mess around if a patient has any changes in mental status, and that is an immediate evacuation.

Regarding chest trauma, our biggest concern is breathing difficulties and how hard they work to breathe; pay attention to their breathing.

Traumatic abdominal injuries are challenging to assess and manage in a backcountry setting. Always assume the worst if diagnosing the injury proves to be difficult and evacuate immediately.

We will mostly see soft tissue injuries in backcountry first aid situations. Dealing with cuts, scrapes, bumps, bruises, and blisters is commonplace in the backcountry, and we should know how to do it properly. A first aid kit well-prepped for dealing with soft tissue injuries is a must. The most crucial aspects of managing soft tissue injuries are cleaning wounds, changing dressings and bandages frequently, and monitoring.

Medical

Introduction - Medical

There are thousands of medical problems that may cause a patient to suffer. This section discusses identifying and managing the most common medical problems we might encounter in the backcountry.

In the section on chest pain, we will learn that differentiating chest pain in a traumatic injury versus a medical problem, specifically heart attacks, is crucial.

We will examine shortness of breath as a medical problem and learn about common issues like asthma and other underlying breathing difficulties.

We will also discuss the acute abdomen, which includes diarrhea, constipation, nausea, and vomiting, and the procedures for dealing with them in a backcountry setting.

Finally, we will touch on a few much less common medical issues we might encounter, like seizures, to ensure we are well prepared for anything.

Chest Pain

In medicine, like in trauma, thousands of problems can occur; however, this course deals with the most common that we will likely see. With that in mind, we are going to start with chest pain.

Chest pain can have a dangerous origin, or chest pain could be benign. It is our job to figure out which one.

The first thing to do when someone is complaining of chest pain is to find out if there was a traumatic incident; remember, in the absence of a traumatic incident, it is not trauma. So if they were not hit in the chest or did not fall, then there is no trauma.

Additionally, suppose a patient is complaining of chest pain, and we can reproduce that pain by pushing on it or having them breathe. In that case, it will not be medicine, and there will be some other issue, like soft tissue, strain, fracture, or something of that nature.

So if the pain in the patient's chest is reproducible when they are breathing or we are pushing on it, then we are not thinking of chest pain from a medical condition.

If we ruled out trauma, we now know we are dealing with chest pain of medical origin.

Myocardial Infarctions

When discussing a medical chest pain issue, we will focus on the heart, specifically myocardial infarctions (MI). The common term for MI is a heart attack, but since we are in medicine, we will call them MI or myocardial infarction.

Myocardial refers to the muscle of the heart, the myocardium. An infarction is when we block off blood flow and oxygen to an area. When it is a myocardial infarction, it is a lack of blood flow and oxygen to the muscle of the heart. Think of it as putting a tourniquet on a blood flow to the heart. When that happens, the muscle of the heart starts to die. When a patient has a heart attack, the signs and symptoms are due to the heart's muscle dying.

There are very few things in medicine where time is a critical factor, and in a MI, time is paramount. Every minute that goes by for a patient having an MI, the less likely the chance of surviving. Time is essential when it comes to the heart muscle. If we suspect someone is having a heart attack, and it looks and acts like a heart attack, it is a heart attack until a physician or somebody with higher medical training says it is not. The outcomes are devastating if we treat it as nothing major when it is a heart attack.

Identifying a Myocardial Infarction

Understanding how the heart works is essential. There are two systems for blood in the heart. One system is how blood passes through the heart's chambers, inside the muscle, and is pumped out to the lungs to pick up oxygen, drop off carbon dioxide, back to the heart, and then out to the body. The other system we, in this course, are most concerned with is the arteries that feed the heart muscle, called the coronary arteries.

Coronary Arteries

The coronary arteries surround the heart and bring oxygen and blood flow to that heart's muscle to keep it beating. If any of the coronary arteries are blocked, this cuts off oxygen and blood flow to the muscle, then tissue death occurs and destroys the heart. That is a myocardial infarction.

The location of the blockage determines the severity of the myocardial infarction. A blockage in a small coronary artery will only affect a small portion of the heart. However, there is no such thing as a minor heart attack; all heart attacks are bad.

A blockage in a more significant artery, usually higher up on the heart itself, can affect most of the heart's muscles. This kind of blockage is often referred to as a "widowmaker." With a blockage affecting most of the heart muscle, survivability rates are low. We want to do everything we can to help this patient survive.

Coronary Artery Blockages

A blockage in the coronary arteries happens in a couple of ways. In one scenario, a clot can form somewhere else in the body and break off, float through the vessels and the heart, exit the heart's interior into one of the coronary arteries, and get lodged.

More likely, though, is that the patient has coronary artery disease. Coronary artery disease is widespread in the population. Coronary artery disease means that this patient ate, drank, and smoked themselves into having vessel disease. They have a buildup of plaques clotting off and narrowing down the passageway.

Coronary artery disease also hardens the arteries so they can not expand and contract easily. Someone going into heart surgery may have heard they had an 80% occlusion of a coronary artery, which means 80% blockage with plaques. When the occlusion blocks enough blood to the myocardium, the heart muscle starts to die, and the patient has an MI because they are not getting enough blood flowing through their coronary arteries.

Coronary artery disease is a common factor, but there are other risk factors for heart attacks; the patient's family history of coronary artery disease, smoking, obesity, and diabetes are all risk factors for heart attacks.

Signs and Symptoms for Myocardial Infarctions

An MI will manifest as one or many different signs and symptoms: crushing substernal chest pain in the middle of their chest, like an elephant is sitting on them; having a hard time getting a full breath of air; nausea, vomiting, sweating; pale cool and clammy skin; pain radiating to the neck, left or right shoulder or into the back; a feeling of impending doom or anxiety where the patient will often say they are dying. Any of these signs and symptoms can indicate a myocardial infarction.

Some populations of people may present an MI differently.

For a long time, the medical community thought women presented MI differently than men, but that has since been disproven. However, there is one slight difference between a male patient and a female patient with signs and symptoms of a MI. The male patient will often deny the existence of the heart attack, whereas a female patient will accept it but state that they have other things to take care of right now.

The populations that present MI differently are the elderly and diabetic patients. These populations may not have the classic signs and symptoms. They may undergo what is commonly termed as a "silent heart attack." A silent heart attack does not mean it is a good heart attack. It means that, for whatever reason, the nerves carrying the signals to

the brain for the heart attack got lost somewhere. Elderly and diabetic patients may present vague symptoms such as weakness, fatigue, or shortness of breath.

Treatments for Myocardial Infarctions

We have three options in dealing with a patient we suspect has a MI. First, keep them calm because the calmer the patient, the slower the heart rate and blood pressure, and the less stress put on the heart. Second, evacuate. Evacuation poses challenges, but we must get this patient out quickly. Third, consider medications.

Medications for Myocardial Infarctions

One of those medications is aspirin. If the patient is not allergic to aspirin, they can receive aspirin.

However, we never give medications without knowing the dose of the medication. The dose for aspirin for this patient is 4 x 81-milligram aspirins. These are known as low-dose aspirin, sometimes called baby aspirin (note: do not call them baby aspirin because babies can not have aspirin). We want them to be chewable because it gets absorbed quickly. Make sure that the aspirin bottle in our first aid kits says chewable.

It is not the end of the world if it is not chewable; make sure to administer the correct quantity of 325 milligrams and that the patient is not allergic.

Aspirin is an antiplatelet drug that prevents platelets from sticking together and forming larger clots, allowing blood cells to slip by. Aspirin is the best treatment available in the field or in an ambulance.

Another medication is nitroglycerin, often prescribed for patients with known heart conditions or previous MI's. When searching for a patient's nitroglycerin prescription,

ignore the packaging and always read the label. Nitroglycerin, in pill form, tends to come in a little brown bottle with a white top. Remember that nitroglycerin is unstable and quickly degrades when exposed to air or light. The patient must already have a nitroglycerin prescription; we are just helping them take it.

Nitroglycerin is a highly potent vasodilator that expands the vessels that feed the heart. If the patient has a blockage in a vessel, and we expand the size of the passageway, then the blood can get through. Nitroglycerin temporarily relieves stress on the heart and does not solve the problem. We are dealing with a heart attack, and evacuation is critical.

Nitroglycerin typically comes in 0.4-milligram pills, but read the label. The dosage is 0.4-milligrams every 15 minutes, as long as symptoms persist, up to three doses.

A caveat about this potent vasodilator is that it dilates the blood vessels, not just in the heart but in the entire body, potentially causing an unsafe drop in the patient's blood pressure. For that reason, monitor for a strong radial pulse before administering to ensure good blood pressure. Do not give this medication if their pulse is weak. Again, the max dose is up to three times.

With any heart attack, evacuation is necessary.

Evacuation of Myocardial Infarctions

Getting an MI patient out of the backcountry poses some difficulties. Ideally, they walk out since walking is always the fastest way to get anyone out of the woods. While we want to get them out quickly, it is worth considering that physical exertion while walking can stress the heart. The more they exert, the more the demands on the heart, causing the MI to worsen, putting more stress on the heart, and creating a feedback loop. We

can wait for a rescue to come in, which puts no stress on the heart but takes much longer.

The best decision in this situation will depend entirely on our ability to reason based on the information. Regardless of the decision, never forget that if it acts or looks like a heart attack, even if it seems far-fetched, treat it like a heart attack until a medical provider says otherwise.

Angina

There is one more thing that might cause some confusion, and it is called angina. Angina is a heart attack or MI that the patient did not happen to die from at that moment.

Angina is when coronary arteries are partially blocked. Perhaps they are 50% blocked, and the patient at rest is doing fine because their heart does not demand much oxygenated blood. However, suddenly the patient gets up, starts exercising and moving around, and the demand for the heart increases. Because the artery is blocked and can only send 50% of the oxygenated blood, yet the heart muscle demands more, we get angina. The signs and symptoms include chest pain, anxiety, pain radiating to the neck, jaw, shoulders, and back, nausea, vomiting, and pale, cool, clammy skin. It looks just like a heart attack because it is.

Here is where it gets tricky. For instance, the patient experiencing these symptoms sits down, rests, and stops doing whatever they were doing for 10, 15, or 20 minutes and all the symptoms go away. Now they went away because the demand had dropped. So the patient declares they are okay, calls it a weird episode, and tells everyone not to worry.

We will worry and treat it exactly the way we would treat a heart attack with symptoms that persist with no relief. Just because they got lucky this time does not mean they will not have a massive heart attack next time.

Hopefully, we now better understand how the heart works and what causes a heart attack. Knowing what it looks like will direct our treatment and help us recognize the need to evacuate these patients.

Shortness of Breath

The system that can present true life-threatening emergencies is our respiratory system.

In this section, we will discuss the respiratory system and breathing problems with a heavy emphasis on the main one we will encounter: asthma.

Asthma is a fairly common condition. A trigger for somebody's asthma attack can be environmental, exercise, behavioral, or psychological, but whatever the trigger, we know it causes breathing difficulty.

Let us review how and why we breathe. Why we breathe is based on the pH level in our blood. When that pH level changes, we get more acidic or basic; thus, we breathe faster or slower to regulate our pH. How we breathe is based on pressure. The pressure inside our thoracic cavity gets lower when the chest gets bigger, and we draw in air, and the pressure increases when the chest gets smaller, and we push out air.

Moving air into the lungs is more a factor of how much air moves out than the amount of air coming in. The more empty the lungs, the more air can enter.

Asthma

Interestingly, asthma is an air-trapping problem. Moreover, it is a reactive airway disease because our respiratory system overreacts to an experience, an environment, stress, or exercise.

With asthma, the respiratory system clamps down on the airway passages and increases mucus production inside the lungs. Increasing mucus production and clamping down on the airway could be an excellent reaction to a foreign contaminant. However, asthma is an overreaction. With asthma, the system continues to clamp down and produce mucus beyond what is needed trapping air inside the lungs.

When someone with asthma breathes out, they can not fully empty their lungs. With each subsequent breath, they take in less air, and the amount of air they have trapped in is more, and the cycle continues.

The positive here is that asthma will be the most straightforward diagnosis we will make with wilderness first aid.

We will see a patient bent over with their hands on their knees, a rock, or a tree. This classic position is called tripodding. Combine this with apparent difficulty breathing, and it should seem pretty obvious at this point. However, we can diagnose as soon the patient says they are having an asthma attack.

A patient with difficulty breathing that does not have asthma is most likely not having an asthma attack. So if someone has difficulty breathing and does not say they have asthma, then it is not asthma, and it is something else. In that case, ask questions and do the detective work to figure it out. Nevertheless, if they are tripodding, trying to catch their breath and say they have asthma, it is asthma.

Treatment for Asthma

Just like with other medical conditions, we first try to calm the patient down. The more we can calm them down, the slower they can breathe and the more they can breathe out.

Another technique is to have the patient do pursed-lip breathing. Pursed-lip breathing means breathing as if blowing out a candle. Pursed-lip breathing is a technique used in mountaineering at high altitudes to increase the back pressure in the lungs. By breathing out through pursed lips, we increase the pressure in the lungs forcing more air back out, thus creating more capacity for air to come back in.

These techniques are palliative care and may or may not work; ultimately, a patient having an asthma attack needs an inhaler.

The packaging for the inhaler does not matter. We are looking for a rescue inhaler containing either or both albuterol and ipratropium bromide. It is not a rescue inhaler if it does not say one or both of those drugs. It might be their daily inhaler that they use, but that will not help them in this situation.

It is essential to ignore the packaging because there are medications on the market right now that look exactly like a rescue inhaler and, if given to an asthmatic by mistake, will kill them. The key is to read the label for albuterol, ipratropium, or both together.

An inhaler takes all the airway passages and fully expands them so more air can move back and forth.

The inhaler will be their prescription; they should already know how to use it, but we will help them. To use the inhaler, first, have the patient take the top off the part for their mouth. They will put it in their mouth and must coordinate breathing in and squeezing simultaneously. What comes out is a mist that goes into their lungs.

The dosage or the amount of times the patient can use the inhaler is as many times as they need to alleviate the asthma attack.

This medication has side effects, including nervousness, jitters, and a possible headache. An amped-up feeling is perfectly normal.

If these techniques do not work, there is one last approach. This technique will only be applied if all else fails. It is called a bear hug. Stand behind the patient struggling to breathe, wrap arms around their chest, and when they breathe out, squeeze on their chest to force more air out and help them contract their chest even more.

Hyperventilation.

Hyperventilation is another common problem to encounter. All sorts of things cause hyperventilation, but more often than not, it is psychologically induced. It does not mean that it is a psychological problem. A broken bone or another traumatic incident can cause someone to start to hyperventilate.

Hyperventilation in and of itself is not dangerous, but it is a self-perpetuating mechanism. When patients start hyperventilating, they breathe rapidly and blow off a lot of carbon dioxide, causing their pH to become basic and affecting how their nerves transmit messages.

For instance, anyone who has had a panic attack with hyperventilating knows the tingly feeling they have gotten in their face or hands with their skin feeling like pins and needles. That happens because the pH is out of balance. The problem is that the general public does not know that and when they experience these imbalance symptoms, they start to hyperventilate even more.

As the hyperventilating worsens, we start to get carpopedal spasms in the hands and feet. Now, because those nerves are no longer functioning correctly, the muscles start to contract, and the patient gets “Tyrannosaurus Rex” hands and starts to panic even more.

To treat hyperventilation, we must get the patient to break the cycle and get them to focus on something else. Start by trying to calm their breathing down by breathing in through their nose and out through their mouth. It is more challenging to breathe fast by taking breaths through the nose and out through the mouth.

Breathing into a paper bag does not do anything scientifically, but psychologically it does a lot. It works because people believe it works, so if that works for somebody, fantastic.

Lastly, let us revisit tripodding. People usually tripod to catch their breath at the end of a long hike, a run, or a big workout. A patient having trouble breathing who is tripodding is engaging all of the accessory muscles in their neck, shoulder, side, and back muscles to breathe. It allows them to pull their chest bigger and crush it smaller than if they were standing. When their chest is bigger, it lowers the pressure, helping them to take in more air; when their chest is smaller, it increases the pressure, helping them release more air.

Many of us were told in high school to put our arms above our heads to catch our breath; this is complete nonsense. Placing hands over our heads eliminates the use of our accessory muscles, making us less able to breathe than just standing. This is the worst possible position for someone having difficulty breathing.

When a patient has difficulty breathing, we want them to be in the position that is most comfortable and conducive for them to take big, deep breaths to lower their work of breathing. So let patients get in a position that's good for them as long as it is not dangerous.

Acute Abdomen

The final medical area is the acute abdomen. Acute means it is happening right now versus a chronic or long-term condition. The abdomen refers to the part of the body containing the digestive organs, the belly.

As aforementioned, we hope for a problem we can address because the abdomen is very difficult to manage in a backcountry setting. Though perhaps unpleasant, we can address problems such as nausea, vomiting, diarrhea, and constipation.

Anyone who spends time in the woods will likely feel nauseous, get diarrhea or become constipated in most backcountry settings. It happens all the time because we are out of our routines, eating food that we are not used to, maybe in a foreign country, and are

unlikely to consume many fresh fruits and vegetables. These types of problems are going to occur.

The thing to know about these problems is that nausea, vomiting, diarrhea, and constipation are usually self-correcting. We manage the patient and perhaps help things along when possible, but we have to do very little to treat them. One of the things to be careful of is being aggressive regarding nausea, vomiting, diarrhea, and constipation when it is unnecessary.

Nausea

Let us start with nausea. Nausea is the feeling of an upset stomach, which can happen for any reason. We have all had an upset stomach before. Bland foods can help, but in the backcountry, we are stuck with the food we have brought, so that may not be an option. Staying hydrated is an excellent thing to do if it makes the patient feel better. Nausea medication, like Pepto or Tums, if it is an acid problem, are essential items for any first aid kit.

Also, be sure to ask the patient if they have a prescription, like Zofran, an anti-nausea medication. The patient may have this issue regularly, so we need to find that out in our patient assessment.

Vomiting

Vomiting, on the other hand, happens for a reason. The body is vomiting to rid itself of foreign contaminants inside the stomach. Therefore, we do not want to stop the vomiting.

Sure, we want to stop vomiting if we are on holiday with limited time and need to travel to our next destination. However, if we give patients vomiting something to halt the process, we keep the foreign contaminant inside their body for longer, making it worse.

We give someone an antiemetic to stop them from vomiting, like Zofran, when it has become intractable, meaning they cannot get past it. We do this when they cannot keep anything down, it has been 24 - 36 hours of vomiting, and they are getting weak. At this point, evacuation may make sense.

Constipation

Constipation is prevalent in the backcountry, but we want to avoid outside treatments. Many people hear constipation and think suppository. However, if we give a patient a suppository when not indicated - a valid medical reason - we end up with diarrhea.

First, we want to keep the patient hydrated by making them drink lots of fluids. They are constipated because they are pulling too much fluid out of their bodies. High-fiber foods like fruits and vegetables are ideal but often usually unavailable. We can evacuate if constipation does not resolve with hydration and high-fiber foods or if the pain becomes too great.

Diarrhea

Diarrhea is likely to occur in a group anytime that group travels or is in the backcountry. Diarrhea is an uncomfortable and unpleasant experience for anyone, and no one wants it to ruin their trip. However, like vomiting, we do not want to treat it unless it becomes intractable.

Treatment for diarrhea is, almost always, to let it run its course. While this might not be enjoyable, it is what needs to happen. Like vomiting, diarrhea is the digestive system trying to flush out contaminants. If we stop the bowel movements, we keep the contaminants in there longer.

Something to consider is that treating diarrhea with antibiotics has become a big problem all around the world. The primary treatment for diarrhea in many areas of the world, such as traveler's diarrhea, is antibiotics, despite not being indicated, resulting in inappropriate dosing and regimens. As a result, antibiotics are ineffective in Nepal

because foreign travelers taking antibiotics for diarrhea and vomiting have created superbugs.

Yes, diarrhea is unpleasant and uncomfortable, but the treatment is to let it run its course. Most diarrhea will self-correct in three to five days.

Also, avoid antidiarrheals; they are not the best treatment.

Ultimately, keep the patient hydrated because diarrhea causes the patient to lose fluids. Coach the patient to eat and drink. If we see no progress and the symptoms worsen, or we notice a change in mental status, we want to consider further treatments and get the patient out of the woods.

When it comes to the acute abdomen, we hope they are suffering from nausea, vomiting, or diarrhea. Because, when it comes to the abdomen, if we cannot narrow down the diagnosis to one of those, then, in general, there is nothing we can do but end our trip and evacuate.

Let us examine diagnosing some more significant concerns regarding abdominal medical problems we might encounter in the backcountry.

Appendicitis

The first is appendicitis. Appendicitis is all too common, happens entirely unexpectedly, and presents as pain in the abdomen.

The appendix sits at the end of the intestines and off to the side. For some reason, something floating through the intestine diverts into the appendix and gets stuck. After some time, that "something" starts to rot and initiates an infection, causing the appendix to swell. This swelling is the pain the patient is feeling.

Appendicitis Signs and Symptoms

Appendicitis will first present as periumbilical pain right around the belly button. If at the assessment stage, when asking the patient when and where the pain started, they state that it began in or around their belly button and then moved down to the lower right quadrant of the belly, they likely have appendicitis.

One test we can perform is the rebound tenderness test. For this test, we push on the pain spot, which should relieve the pain, but when we let go abruptly, the pain becomes excruciating; this is a classic sign of appendices. The rebound tenderness test is not diagnostic and not one hundred percent certain, but it is the best we can do in the woods.

Another test is to have the patient lie down with straight legs and slap the bottom of their right foot pretty hard. This test sends a wave up their leg and pushes into the inflamed appendix. If this causes pain, it is another sign that they may have appendicitis.

Also, watch out for nausea and vomiting. The patient will not want to eat and is usually in a fetal position. These are difficult signs since they are typical for many abdominal problems, and it is easy to mistake appendicitis for constipation or a stomach bug. So be sure to run through many different tests.

If we suspect appendicitis, it can become a critical life-threatening emergency; we need to get the patient out.

Note that if we assessed the patient and determined they have appendicitis and the pain suddenly disappeared, get out faster because they likely burst their appendix. The pain went away because the inflammation went away. The problem is that the appendix, which contained that rotting material, has now exploded inside the abdomen, which can rapidly cause sepsis or full-body infection. Overall, appendicitis is a surgical concern that should be evacuated immediately.

Ectopic Pregnancy

A question we need to ask women complaining of abdominal pain is if there is a possibility they could be pregnant. Do not ask if they are pregnant; ask if there is a possibility they could be pregnant.

We need to rule out whether or not they have an ectopic pregnancy. While uncommon, it is worthwhile to be aware. An ectopic pregnancy is when an egg implants outside the uterus, sometimes in the fallopian tube and sometimes in the abdomen.

If a female patient presents with vague abdominal pain, which we cannot attribute to something else, and they say there is the possibility that they could be pregnant, evacuate immediately. An ectopic pregnancy is a life-threatening emergency worth taking seriously.

Many other medical problems occur in the abdomen but are not discussed because they are either rare, undiagnosable, or untreatable by us in the backcountry.

Nevertheless, if something happens with the abdomen, be it trauma or medical, try to sort it out. Fingers crossed that it is nausea, vomiting, or diarrhea, but if not, or we are not sure, head out to the front country for definitive care.

Review - Medical

There are thousands of medical conditions, and we have only covered the most common we might find in the backcountry.

Medicine is a detective story that requires lots of questions and good listening to what the patient says. Putting together the pieces of the story might require going back hours, days, or even years to get a good history of the patient to construct a clearer picture of what is happening right now. Use OPQRST to help get the questioning started.

With chest pain, we are thinking about heart attacks or angina. If it acts and looks like a heart attack, even if signs and symptoms go away, it is a heart attack until a medical professional tells us differently. Do not let the patient talk us out of thinking it is a heart attack. Time is crucial when it comes to chest pain and heart problems.

With difficulty breathing, the most common cause is asthma. Ensure the patient has their inhaler because preplanning with an asthmatic is critical. Regardless, with anyone having difficulty breathing, be it from asthma or something else, pay attention to how hard they work to breathe. The harder the patient works to breathe, the more they will struggle. Furthermore, it becomes a self-perpetuating cycle, and we must help them break it. If the patient needs evacuation, find the best way to do it as quickly as possible because there is very little we can do for patients struggling to breathe in the wilderness.

When there is an acute abdomen problem in the backcountry, this will be the only time in life we will hope that someone tells us they have diarrhea, constipation, nausea, or vomiting. Someone with abdominal pain that we cannot ascribe to one of those is never good. Like with traumatic abdominal injuries, there is very little we can do for the abdomen in the backcountry. We can only evacuate and monitor if it is not nausea, vomiting, constipation, or diarrhea.

Finally, if heading into the backcountry with other people, identify their chronic medical conditions and unveil what might happen in the backcountry. It is always better to know beforehand.

Environmental

Introduction - Environmental

This section will discuss the environmental risks that can pose problems for people in the backcountry.

We will assess bites and stings and discuss more about anaphylaxis.

We will also discuss heat and hydration because hydration is one of the most important topics we can discuss throughout this class.

Lastly, we will examine hypothermia, how it affects the body, and what we can do to prevent and manage it.

Bites and Stings

We will discuss many bites, stings, and envenomations, but let us start with the ubiquitous little creatures known as ticks.

Ticks

Ticks are everywhere, and there are many diseases that ticks can transmit. The one most people are familiar with is Lyme disease, but there are others like babesiosis, and rocky mountain spotted fever, to name a few.

When it comes to ticks, the best thing is prevention. We want to make sure that the tick does not get on us. We do this with tick repellent sprays, wearing long clothing, and keeping pants tucked into socks. We also perform tick checks every time we finish hiking or playing outdoors.

However, there is no need to panic. While ticks are undoubtedly disgusting little creatures, they take time to transmit disease.

To remove a tick, grasp it by the skin down near the base and gently lift it straight up. There is no need to burn or smother it. The problem is when people rip and tear the tick out, leaving the head inside still attached. Make sure to remove the entire tick. We can buy lots of different tools to do this, but tweezers work fine.

Lyme disease used to be an untreatable disease. People still suffer from chronic Lyme nowadays, but most have had Lyme disease for quite a while. Nowadays, if someone comes in with vague flu-like symptoms after exposure to a tick, they will get a blood test called a Lyme titer. If they have Lyme, a standard doxycycline treatment will address any problems. It is getting rare, but the problem arises when it goes undetected.

A tick bite does not automatically mean infection. If the tick is diseased, it must be on the patient for at least 24-48 hours before it transmits any disease. So if we are out hiking and come home in the evening and find a tick, remove it, and all is well. Also, a bit of advice, do not bring the tick to the hospital; they have no use for it; leave it at home and flush it down the toilet.

The other thing to think about is that only 50% of people get the bullseye rash we associate with Lyme disease. If the patient has one, it is undoubtedly a sign of Lyme disease, but a patient without one does not necessarily mean they do not have it.

Scorpions

Scorpions can inflict an excruciating sting but are rarely deadly. Like most things, they are more deadly for the elderly, the young, or people with chronic underlying conditions.

When it comes to scorpions, it is best to check for them diligently in regions where they live. They hide in boots, the bottom of sleeping bags, and tents. Always check to ensure they are not there before putting those things on or getting into them.

With a scorpion sting, there is not much we can do besides palliative care by making the patient more comfortable and monitoring any adverse reactions. If the patient gets worse, evacuate. If the pain is overly dire, evacuate.

Spiders

The spiders we discuss are specific to North America, but these strategies are helpful anywhere. When traveling, learn more about the creatures that cause bites and stings. In North America, there are two spiders whose envenomations are concerning: the brown recluse and the black widow.

Brown Recluse Spider

The brown recluse spider is a small brown spider carrying hemotoxin. Hemotoxin is a broad term for a toxin that breaks down the blood and the tissue inside the victim to liquefy the prey so the spider can eat it.

A brown recluse spider is tiny, and its prey is even tinier. For this reason, a person may not even know the bite occurred until several hours later when a red and angry wound appears. The patient might not seek care, but the wound becomes necrotic or dead over a few hours or even days because the toxin destroys the tissue.

We treat this like any other wound. As the wound progresses, it becomes more necrotic as the tissue dies and goes untreated. As the infection festers, the patient can develop gangrene leading to many other complications. Hopefully, by this point, we will have recognized this is a nasty wound, managed it like any other wound, and gotten the patient out.

If the patient knows a brown recluse spider has bitten them move towards the front country immediately. A brown recluse spider bite is not a death sentence, but we also do not want our patient to lose a hand, a toe, or a finger.

Black Widow Spider

The black widow has an evil reputation as a killer and has a more powerful, different type of venom called a neurotoxin. A neurotoxin is a broad term for a toxin that affects the nervous system. The purpose of the toxin for a black widow spider is to paralyze the diaphragm to stop the prey from breathing, so it is easier to kill and eat.

We are much bigger than a black widow and unlikely to die from a black widow spider bite unless in an at-risk population. Their bite may go undetected. The symptoms of a bite are abdominal cramping, difficulty breathing, anxiety, nervousness, and pale, cool, clammy skin.

If those things happen due to a black widow, start to evacuate. Other than that, we can do nothing besides palliative care and monitoring. They are rarely deadly, just very painful.

Snakes

Pit Viper Snakes

The pit vipers encompass many snakes, including cottonmouths, water moccasins, rattlesnakes, and copperheads. Pit vipers have heat-seeking pits on the side of their diamond-shaped heads.

What they do is inject a hemotoxin. Since their prey is larger, their bites can cause more damage to people. However, patients are still unlikely to die from a pit Viper envenomation, although their progression for wounds and wound necrosis can progress rapidly.

The treatment is palliative, with nothing else we can do. Do not put ice, a tourniquet, or a wrap on it. Do not cut and suck, and do not purchase a snake bite suction kit; it is snake oil. Focus on taking care of the patient, monitoring their vitals, and getting them to definitive care.

Coral Snakes

Coral snakes carry a highly potent neurotoxin with the potential to kill. Luckily they are timid animals.

A coral snake has a distinctive colored pattern on its skin. There is a saying that goes red on black venom lack; red on yellow, kill a fellow. That means a snake whose red and black stripes are touching is a mimic and harmless, and one with red on yellow is a coral snake and can kill.

Most poisonous snakes have fangs and leave two bite marks on a patient, but the coral snake has teeth and will chew with its teeth to ensure its poison enters the victim.

Like the black widow, the venom of a coral snake causes paralysis of the diaphragm, resulting in difficulty breathing, abdominal cramping, nausea, and vomiting, but on a much faster timeline with a higher likelihood of death.

Treatment is to get out of the woods fast. In general, it is worth knowing what kind of snake or spider bit the patient, but do not try to capture it; it is not worth the risk of getting bitten. Identify if possible and get to the hospital quickly.

Wasps and Hornets

Wasps and hornets pose the problem of anaphylaxis, but the more significant danger is that they can sting multiple times, unlike a bee. Wasps and hornets can sting us repeatedly as they do not leave their stinger in the skin. The danger here comes when a patient runs into a nest, gets 50, 100, or 200 stings, and has an overwhelming body response. In this case, we evacuate immediately. However, a patient who is stung once or twice is in no danger of death. We treat the patient with palliative care by taking care of them, considering pain medication, and applying ice on the sting spot if possible.

Bees

When a bee stings, the stinger is removed from the bee's abdomen, and the bee flies away and dies. The venom sacks are attached to the stinger that was left behind. Despite the bee having left and died, the stinger continues to pump venom into the skin. For this reason, we first need to remove the stinger. To remove the stinger, scrape along the skin.

In terms of care, a bee sting could be a bee sting, at which point we provide ice and palliative care. On the other hand, it could evolve into anaphylaxis.

Anaphylaxis

Anaphylaxis is a severe allergic reaction resulting in airway compromise and breathing difficulty. It happens when a body overreacts to an allergen. A typical allergic reaction is when the body recognizes an allergen, releases certain chemicals to wall it off, sends things to fight it, and stops the body from reacting.

The main chemical responsible for the allergic reaction is called histamine. Histamine has a role in many bodily processes like inflammation, dilating blood vessels, and affecting muscle contractions in the lungs, to name a few. In a normal allergic reaction, the histamines act at a localized spot. For instance, a patient is stung by a bee and gets a raised red welt at the sting location or has seasonal allergies and gets watery, runny eyes and stuffy nose. Those are all caused by histamines.

Alternatively, an anaphylactic reaction causes a systemic reaction. Instead of getting a reaction at the spot where the bee stung them, their entire body reacts, and they release histamines everywhere.

Therefore every blood vessel in their body opens up, every blood vessel in the body becomes leaky, and their airway passages clamp down. Most recognizable is that the blood pressure starts to tank, and they cannot breathe. So, when we interpret anaphylaxis, we look for breathing difficulty and airway swelling.

We can treat someone with an anaphylactic reaction, but we want to ensure we are treating anaphylaxis. People can have severe allergic reactions and get hives all over their bodies, but if they are not having breathing difficulty, it is not anaphylaxis.

Anaphylaxis is defined by breathing difficulty and always equals an evacuation. If we think the patient is anaphylactic, we must get them out. Even if they improve, we leave the woods, regardless of what comes next.

To treat anaphylaxis, we are going to do two things. They both have a role to play because one buys us time, and the other works on the mechanism to stop the reaction.

Epinephrine

The one that buys us time will be an epinephrine auto-injector. Epinephrine is commonly known as adrenaline.

Epinephrine constricts blood vessels, thus making them smaller, therefore increasing blood pressure. Epinephrine also causes bronchodilation, which opens the airway passages allowing

for better breathing. Epinephrine does not cure anaphylaxis, but it buys time to apply further treatment to stop the reaction from progressing.

Administering epinephrine works within one to two minutes but wears off in ten to fifteen minutes and only relieves the symptoms.

Diphenhydramine

Since histamines cause the whole reaction, the most important step is to give the patient an antihistamine. The most common one is diphenhydramine, but many antihistamines are on the market. The dose for diphenhydramine is 50 milligrams; however, it takes about 30 minutes before this starts working.

Notice a discrepancy; epinephrine only lasts 10 to 15 minutes, while diphenhydramine takes 30 minutes to start. Give another dose of epinephrine if the patient shows signs and symptoms of anaphylaxis again. Usually, epinephrine autoinjectors come in two packs for this reason.

Even if the patient improves, we are still leaving the woods because the patient will likely need further treatment.

A common reason for canceling outdoor trips and unnecessarily evacuating patients is the misuse of epinephrine in the backcountry. If we think we need to use it, go ahead; the worst thing is an unnecessary evacuation. However, to be a good medical provider means we know to look for breathing difficulty as a sign of anaphylaxis. Otherwise, we can give them an antihistamine for an allergic reaction and monitor for any further treatment or evacuation.

Heat and Hydration

The topics of heat and hydration are vital in the backcountry. Hyperthermia
We will start with hyperthermia (hyper = high, thermia = heat). Most of us are more comfortable being hot than cold, so hyperthermia is not something people usually

consider. Many recognize that they are getting hot but rarely worry about getting hyperthermic. However, hyperthermia kills more people than hypothermia.

There are multiple stages of hyperthermia.

Heat Cramps

The first stage is heat cramps. We have all likely done an activity when it is hot out, which may have resulted in cramps. Heat cramps manifest as abdominal pain, nausea, and general malaise.

The fix for heat cramps is to stop the activity, get in the shade, and have some water and a snack. We need to learn to recognize this first stage of hyperthermia in ourselves so we can recognize it in future patients and hiking partners.

Heat-Induced Dehydration

The second stage is heat-induced dehydration. Heat-induced dehydration is when we lose too much fluid through sweating. Sweating is our body's best mechanism for cooling, as we efficiently disperse 80% of our heat to the environment through evaporative cooling. Sweating is good, but we lose fluid, progressively dehydrating us.

The patient's signs and symptoms of losing too much fluid are nausea, vomiting, disorientation, confusion, and headaches. Have the patient stop the activity, get into the shade or somewhere cool, remove restrictive clothing, and drink or eat until wholly recovered. If the patient does not recover, evacuate. Even if they do, consider discontinuing the activity that caused it in the first place.

Heat Stroke

The last stage is heat stroke. Heat stroke occurs when the average body temperature of 98.6 degrees rises by more than 5 degrees, which is not that much. We will see later on in this course how hypothermia differs in how far our body temperature can drop before it becomes dangerous, and many of us will be surprised.

In hyperthermia, five degrees is an average. For some people, it could be less; for others, it could be higher, but 104 is our threshold. At 104 and above, the body starts to denature proteins and kills off organs causing severe complications and ending up with heart dysrhythmias, seizures, and ultimately death. Heat stroke, if untreated, kills.

There are two types of heat stroke: classic and exertional.

Classic Heat Stroke

We are familiar with classic heat stroke, where the person gets hot, red, and dry; hot because of the heat; red because they are flushed, and dry because they have sweated to the point where they do not have any fluids left. With no fluids left, they cannot evaporatively cool their bodies using their primary cooling mechanism, and their temperature continues to rise.

Exertional Heat Stroke

When a person suffers from exertional heat stroke, the signs are hot, red, and wet skin. This type of heat stroke is misleading because many of us would assume it is heat-induced dehydration, not heat stroke. For exertional heat stroke, we must be aware of the environment outside and whether the ambient temperature is over 90 degrees or relative humidity is over 70%. Exertional heat stroke happens when the patient cannot lose heat to the environment and employ sweating as a cooling mechanism. If the ambient temperature exceeds 90 degrees, our bodies do not radiate heat to the environment because our skin is at the same temperature. If the relative humidity is over 70%, the sweat on the body will not evaporate.

Most importantly, watch for mental status changes like grumbling, anger, disorientation, confusion, and lethargy. Additionally, as the stages of hyperthermia progress, the patient will go from verbally responsive, to painfully responsive, to unresponsive.

Knowing the physical signs and symptoms of someone who has moved through the stages of hyperthermia lets us learn how to make good decisions.

Treating Heatstroke

When treating heatstroke, first focus on rapidly cooling the patient with water, like a river or pond, or pouring cold water over them. Once they are cooled down and stable, they need evacuation.

Focus next on hydration. Hydration plays an essential role in all our body systems. As we address it here in hyperthermia, recognize that it applies to all the other aspects of providing medical care.

Hydration

There are many theories about the amount of water necessary for our body to function correctly. One is that we need eight eight-ounce glasses of water daily, and another, three liters of water on every hike. An additional one is that we need three times more water at altitude than at sea level.

Hydration is not a function of how much water we put in our body because we can not tell if someone is hydrated based on how much water they have had to drink. Hydration is a personal thing based on each body's needs. One person may need three liters of water daily to be hydrated, while another may need two and yet another six. Therefore, telling someone to drink three liters may cause them to be over-hydrated or under-hydrated.

The only way to know if someone is hydrated is by knowing how their kidney functions. Of course, in the backcountry, actual kidney function tests are impossible because they involve laboratories. However, since our kidneys produce urine, we can observe urine output.

The common belief is that hydrated pee is clear and copious, which is wrong. Peeing clear means we are over-hydrated because the body can not store water for later use. If the body is 100% hydrated, it will eliminate excess fluid, which is why the pee is clear. So clear and copious is the wrong thing to tell people, just like telling people to drink a prescribed amount is wrong.

A formula for hydration status to employ in the field is that the average healthy individual should produce one milliliter per kilogram per hour of urine for proper kidney function. A 60-kilogram person should pee 60 milliliters of water every hour.

Students in the US may think this sounds complicated because they do not use the metric system. Milliliters are simple since most water bottles are designated by ml. To convert pounds into kilograms, divide the pounds in half and subtract 10% from the remaining amount. So 140 lbs divided in half is 70, and 10% of 70 is 7, so a 140 lb person weighs 63 kilograms. Therefore, a 140-pound person should produce 63 milliliters of urine per hour.

The truth is, we do not need as much fluid as is commonly believed. Eating a regular, healthy diet gets us approximately 80% of all the fluid we require; therefore, water only provides 20% of our body's extra fluid.

Okay, it is implausible that people measure their urine every time they pee in the backcountry. Even more unlikely that we can pay attention to anybody else's pee regimen to ensure they adhere to the formula.

The thing to remember and to tell everyone in order to maintain proper hydration is to drink when thirsty.

The saying that we are dehydrated when thirsty would be a flawed system, and it is a complete falsehood that people are chronically dehydrated and that being thirsty is terrible. Imagine if our breathing mechanism only told us to breathe after not breathing

for three minutes. If homeostasis only kicks in after the body is in trouble, we would not be alive today.

So when thirsty, drink. By understanding that hydration is a function of urine output and that urine should be straw-colored and regular but not copious, people will drink the right amount for their bodies. Somebody may need three gallons of water daily for their particular kidney function to produce that amount of urine, while somebody else may only need one liter a day.

Conversely, forcing people to drink and over-hydrate is inconvenient, uncomfortable, and dangerous.

Hyponatremia

One of the most common problems people encounter regarding exercise-induced problems is hyponatremia. Hyponatremia occurs when the concentration of sodium in the blood is abnormally low.

Take, for instance, someone ingrained to consume copious amounts of water. In order to move water through the kidney, our bodies constantly shift certain chemicals back and forth to hold onto or eliminate water. In order to excrete water, particularly when we are consuming large amounts of water we do not need, we shift those chemicals, known as electrolytes, onto one side of the system. With this high concentration of electrolytes now in play, our bodies draw water to that side and then excrete the entire contents. So now, the body is starting to dump sodium, potassium, and magnesium out of the system. This person now exhibits signs and symptoms of dehydration despite drinking excess water. Since it is so ingrained in us that we need to drink large amounts of water and that we are all usually dehydrated, we continue to drink more water.

Hyponatremia looks like dehydration, and this can be a real danger. The danger of losing the balance of electrolytes causes nerve dysfunction, nerves that play a role in causing the heart to beat. As a result of hyponatremia, real difficulties can arise.

Many people wonder whether hydrating with electrolyte fluids helps. The problem is that if the body does not lack something, it does not need more. If we have not lost electrolytes to the environment, which is unlikely on the trail because of constant snacking, drinking them will only cause our body to want to get rid of them through our pee. However, we cannot just pee salt crystals; we must pull water to pee. So when hydrating with electrolytes when our body does not need them can contribute to, or cause, dehydration.

So the simple thing is to drink when thirsty and eat a snack every once in a while. Be sure to tell other people to drink when they are thirsty. Understand our bodies and what they need. Do not listen to anybody else who proselytizes about how much water is the correct amount.

Hypothermia

The final topic to discuss is hypothermia. As mentioned in hyperthermia, hypothermia is less deadly. However, we are more attuned to it because we do not like to be cold; we like warmth.

Remember that with hyperthermia, when we get hot, we denature those proteins. It only takes about a core temperature rise of five degrees for things to go haywire. With hypothermia, it is not until the patient goes from the average of 98.6 degrees down to approximately 84 degrees that we begin to think that perhaps they might not come back. That is almost 14 degrees; that is a lot; that is a big difference.

Hypothermia is self-preserving. When we get cold, our metabolism starts slowing down and inhibiting certain body functions. Think about it like a power outage where the generator powers only the essential items.

As the body gets cold, it shuts off what we do not need to preserve the main components we need, like our brain and heart.

Even if the heart only beats four times a minute, it still supplies the brain with what it needs to stay alive. Being cold is uncomfortable, but it takes a lot to die of hypothermia. For that reason, most people claiming to have had hypothermia have likely never been hypothermic.

With hypothermia going from 98.6 down to 94 degrees is called cold, and it takes a lot to get beyond that. A cold person who does not exhibit any signs of mental status change is just cold; that is it.

It is doubtful we will be able to measure a person's core body temperature in the backcountry, but that is fine because we do not need to. Instead, we are going to look for mental status changes.

Hypothermia Signs and Symptoms

There are lots of other things that are going to happen, but we, as medical providers, pay attention to mental status changes.

Shivering is going to occur. People often think shivering means we are hypothermic, and that is not true. There is a great saying, "we do not shiver because we are cold; we shiver, so we do not become cold." We shiver to produce internal body heat and increase our core body temperature.

Shivering is like turning on the furnace in the body. When a patient is shivering, they are doing good. We may even do things to promote shivering. The shivering can get so intense that it is convulsive, but once the shivering stops, the patient's core body temperature has reached close to the 84-degree mark and has become a metabolic icebox.

Clinical hypothermia, a core body temperature below around 84 degrees, is diagnosed by the presence of mental status changes. A mental status change to watch out for when somebody enters hypothermia is the "umbles." The patient stumbles, fumbles,

mumbles, and bumbles. They cannot perform essential functions properly, and they are forgetful. Watch these mental status changes to observe if the patient is getting colder.

Treating Hypothermia

The first thing we do to treat hypothermia is not to let it happen with appropriate clothing, pay attention to the weather conditions, and keep a watchful eye on those with us.

Remember, just cold is not hypothermic. Just cold is not going to have mental status changes. Suppose we come upon a patient who is complaining of being “hypothermic” but does not have any mental status changes. The best way to warm this person is to have them warm themselves. Make them exercise with jumping jacks, faster hiking, high knees, whatever it takes to get them to move around as long as they can safely engage in an activity. Producing heat from the inside out is best. As long as the patient can safely move around themselves, even if they become hypothermic and exhibit slight mental status changes, physical activity is the best way to warm the patient up.

If the cold continues and they become hypothermic, they will exhibit coordination problems and other changes in mental status. At this point, they may not be able to engage in self-activity safely.

Do not try to heat them with external heating sources like heating pads. We do not want to add heat to them. Instead, we will get them into a warm environment and insulate them. We will place them in a sleeping bag, get them out of wet clothing, get them all bundled up, get a hat on their head, and let them shiver. It might not seem friendly, and they might not be comfortable, but that is the best thing.

Suppose we take a person progressing through hypothermia that cannot actively warm themselves and add external heat. In that case, we blunt their shivering response and ability to heat from the inside out. Heating with external sources is like opening all the

windows of a house and using bonfires outside to heat it versus turning on the furnace. As long as the patient is shivering, let them shiver to bring the heat back to their core.

Now, if they move entirely through the whole progression and get into that metabolic icebox stage, the only option is to add heat because they can not produce their own. So we add heat to this patient, bundle them up and get them insulated. We will want to add the heat source to their core t does not do them any good to heat their limbs because all the blood out there is stagnant, cold, and coagulated.

We want to be very gentle with patients in the metabolic icebox stage. They are in a very fragile state; their heart is barely beating, and cardiac arrest can occur at anytime. So be very, very gentle with the patient.

Nevertheless, hypothermia is very unlikely to kill someone. Most of the time, when we are saying we are hypothermic, we are just cold. It is okay to be cold, but do not confuse it with hypothermia.

Review - Environment

Let us review our environmental risk factors.

The first thing we discussed was bites and stings. Regarding bites and stings, our concerns are envenomations containing neurotoxins and hemotoxins. Remember what the two of those do and which animals have which. People rarely die from an envenomation in the U.S., but it can happen, so always seek medical help by evacuating from the backcountry. Mammal bites rarely cause death but are very prone to infection. Treat these bites in the field by cleaning them thoroughly, keeping the wounds exposed to air and light, and seeking further medical attention.

Anaphylaxis is a true killer. If someone goes into anaphylaxis and does not receive the proper care, they can die. However, remember that anaphylaxis is a breathing problem, and death from it is rare. It can happen but do not overreact.

Hyperthermia is a true killer. Hyperthermia kills many more people than hypothermia, but people are much more comfortable in warm environments and therefore take it less seriously than in cold environments. We are much more attuned to being cold and getting out of that situation than we are to being hot. A temperature that rises only a few degrees is dangerous for a patient. Hydration is personal, and Hydration is all about the person and how their body works.

Hypothermia is uncomfortable, but it is tough to die from hypothermia. We do not like being cold, so watching for mental status changes is the key to understanding hypothermia. Many people get cold, but few get hypothermic, and even fewer die from it, but we do not want to let anyone get into that stage. Pay attention to cold people and warm them from the inside out.

Course Wrap Up

We have just completed the education portion of the wilderness first aid training with American Outdoor School.

Thank you so much for taking this class. We genuinely appreciate it.

There are two things to keep in mind as we finish this course.

First, this is wilderness first aid training. That means anyone who has taken this course has a responsibility to know this material. They do not need to be an expert right now, but keeping fresh is necessary. Every month or so, pull out notes, rewatch this course, pick a topic, go over it, and practice with a friend or family member. Do not get caught a year from now not knowing what to do when something happens.

Second, the practical requirements listed in this course must be completed to get a wilderness first aid certification card.

Thank you again for taking this class. It has been a great pleasure.